DES 10-59 • DOE/EIS-0403 December 2010

Draft Programmatic Environmental Impact Statement for

Solar Energy Development in Six Southwestern States

Volume 3, Part 1

Chapter 9: California Proposed Solar Energy Zones

U.S. DEPARTMENT OF ENERGY

NATIONAL SYSTEM OF PUBLIC LANDS

On the cover:
Typical Solar Fields for Various Technology Types (clockwise from upper left):
Solar Parabolic Trough (Source: Hosoya et al. 2008),
Solar Power Tower (Credit: Sandia National Laboratories. Source: NREL 2010a),
Photovoltaic (Credit: Arizona Public Service. Source: NREL 2010b), and
Dish Engine (Credit: R. Montoya. Source: Sandia National Laboratories 2008).
Reference citations are available in Chapter 1.

Background photo: Parabolic trough facility from an elevated viewpoint
(Credit: Argonne National Laboratory)

Draft Programmatic Environmental Impact Statement (PEIS) for Solar Energy Development in Six Southwestern States (DES 10-59; DOE/EIS-0403)

Responsible Agencies: The U.S. Department of the Interior (DOI) Bureau of Land Management (BLM) and the U.S. Department of Energy (DOE) are co-lead agencies. Nineteen cooperating agencies participated in the preparation of this PEIS: U.S. Department of Defense; U.S. Bureau of Reclamation; U.S. Fish and Wildlife Service; U.S. National Park Service; U.S. Environmental Protection Agency, Region 9; U.S. Army Corps of Engineers, South Pacific Division; Arizona Game and Fish Department; California Energy Commission; California Public Utilities Commission; Nevada Department of Wildlife; N-4 Grazing Board, Nevada; Utah Public Lands Policy Coordination Office; Clark County, Nevada, including Clark County Department of Aviation; Dona Ana County, New Mexico; Esmeralda County, Nevada; Eureka County, Nevada; Lincoln County, Nevada; Nye County, Nevada; and Saguache County, Colorado.

Locations: Arizona, California, Colorado, Nevada, New Mexico, and Utah.

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Abstract: The BLM and DOE are considering taking actions to facilitate solar energy development in compliance with various orders, mandates, and agency policies. For the BLM, these actions include the evaluation of a new BLM Solar Energy Program applicable to all utility-scale solar energy development on BLM-administered lands in six southwestern states (Arizona, California, Colorado, Nevada, New Mexico, and Utah). For DOE, they include the evaluation of developing new program guidance relevant to DOE-supported solar projects. The Draft PEIS assesses the environmental, social, and economic effects of the agencies' proposed actions and alternatives.

For the BLM, the Draft PEIS analyzes a no action alternative, under which solar energy development would continue on BLM-administered lands in accordance with the terms and conditions of the BLM's existing solar energy policies, and two action alternatives for implementing a new BLM Solar Energy Program. Under the solar energy development program alternative (BLM's preferred alternative), the BLM would establish a new Solar Energy Program of administration and authorization policies and required design features and would exclude solar energy development from certain BLM-administered lands. Under this alternative, approximately 22 million acres of BLM-administered lands would be available for right-of-way (ROW) application. A subset of these lands, about 677,400 acres, would be identified as solar energy zones (SEZs), or areas where the BLM would prioritize solar energy and associated transmission infrastructure development. Under the SEZ program alternative, the same policies and design features would be adopted, but development would be excluded from all BLM-administered lands except those located within the SEZs.

For DOE, the Draft PEIS analyzes a no action alternative, under which DOE would continue to conduct environmental reviews of DOE-funded solar projects on a case-by-case basis, and one action alternative, under which DOE would develop programmatic guidance to further integrate environmental considerations into its analysis and selection of solar projects that it will support.

The EPA Notice of Availability (NOA) of the Draft PEIS was published in the *Federal Register* on December 17, 2010. Comments on the Draft PEIS are due by March 17, 2011.

SOLAR PEIS CONTENTS

Reader's Guide

The detailed analysis of the proposed solar energy zones (SEZs) in California, provided in Sections 9.1 through 9.4, will be used to inform BLM decisions regarding the size, configuration, and/or management of these SEZs. These sections also include proposed mitigation requirements (termed "SEZ-specific design features"). Please note that the SEZ-specific summaries of Affected Environment use the descriptions of Affected Environment for the six-state study area presented in Chapter 4 of the PEIS as a basis. Also note that the SEZ-specific design features have been proposed with consideration of the general impact analyses for solar energy facilities presented in Chapter 5, and on the assumption that all programmatic design features presented in Appendix A, Section A.2.2, will be required for projects that will be located within the SEZs.

BLM will implement its SEZ-specific decisions through the BLM Record of Decision for the Final PEIS. Comments received during the review period for the Draft PEIS will inform BLM decisions.

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NOTATION

The following is a list of acronyms and abbreviations, chemical names, and units of measure used in this document. Some acronyms used only in tables may be defined only in those tables.

GENERAL ACRONYMS AND ABBREVIATIONS

AADT	annual average daily traffic
AASHTO	American Association of State Highway and Transportation Officials
AC	alternating current
ACC	air-cooled condenser
ACEC	Area of Critical Environmental Concern
ADEQ	Arizona Department of Environmental Quality
ADOT	Arizona Department of Transportation
ADWR	Arizona Department of Water Resources
AERMOD	AMS/EPA Regulatory Model
AFC	Application for Certification
AGL	above ground level
AIRFA	American Indian Religious Freedom Act
AMA	active management area
AML	animal management level
ANHP	Arizona National Heritage Program
APE	area of potential effect
APLIC	Avian Power Line Interaction Committee
APP	Avian Protection Plan
AQCR	Air Quality Control Region
AQRV	air quality-related value
ARB	Air Resources Board
ARRA	American Recovery and Reinvestment Act of 2009
ARRTIS	Arizona Renewable Resource and Transmission Identification Subcommittee
ARS	Agricultural Research Service
ARZC	Arizona and California
ATSDR	Agency for Toxic Substances and Disease Registry
AUM	animal unit month
AVWS	Audio Visual Warning System
AWBA	Arizona Water Banking Authority
AWEA	American Wind Energy Association
AWRM	Active Water Resource Management
AZ DOT	Arizona Department of Transportation
AZDA	Arizona Department of Agriculture
AZGFD	Arizona Game and Fish Department
AZGS	Arizona Geological Survey

BA	biological assessment
BAP	base annual production
BEA	Bureau of Economic Analysis
BISON-M	Biota Information System of New Mexico
BLM	Bureau of Land Management
BMP	best management practice
BNSF	Burlington Northern Santa Fe
BO	biological opinion
BOR	U.S. Bureau of Reclamation
BPA	Bonneville Power Administration
BRAC	Blue Ribbon Advisory Council on Climate Change
BSE	Beacon Solar Energy
BSEP	Beacon Solar Energy Project
BTS	Bureau of Transportation Statistics
CAA	Clean Air Act
CAAQS	California Air Quality Standards
Caltrans	California Department of Transportation
C-AMA	California-Arizona Maneuver Area
CAP	Central Arizona Project
CARB	California Air Resources Board
CAReGAP	California Regional Gap Analysis Project
CASQA	California Stormwater Quality Association
CASTNET	Clean Air Status and Trends NETwork
CAWA	Colorado Agricultural Water Alliance
CCC	Civilian Conservation Corps
CDC	Centers for Disease Control and Prevention
CDCA	California Desert Conservation Area
CDFG	California Department of Fish and Game
CDOT	Colorado Department of Transportation
CDOW	Colorado Division of Wildlife
CDPHE	Colorado Department of Public Health and Environment
CDWR	California Department of Water Resources
CEC	California Energy Commission
CEQ	Council on Environmental Quality
CES	constant elasticity of substitution
CESA	California Endangered Species Act
CESF	Carrizo Energy Solar Farm
CFR	*Code of Federal Regulations*
CGE	computable general equilibrium
CIRA	Cooperative Institute for Research in the Atmosphere
CLFR	compact linear Fresnel collector
CPC	Center for Plant Conservation
CNDDB	California Natural Diversity Database
CNEL	community noise equivalent level
CNHP	Colorado National Heritage Program

Colorado DWR	Colorado Department of Water Resources
CPUC	California Public Utilities Commission
CPV	concentrating photovoltaic
CRBSCF	Colorado River Basin Salinity Control Forum
CREZ	competitive renewable energy zone
CRSCP	Colorado River Salinity Control Program
CSA	Candidate Study Area
CSC	Coastal Services Center
CSFG	carbon-sequestration fossil generation
CSP	concentrating solar power
CSQA	California Stormwater Quality Association
CSRI	Cultural Systems Research, Incorporated
CTG	combustion turbine generator
CTPG	California Transmission Planning Group
CTSR	Cumbres & Toltec Scenic Railroad
CUP	Conditional Use Permit
CVP	Central Valley Project
CWA	Clean Water Act
CWCB	Colorado Water Conservation Board
CWHRS	California Wildlife Habitat Relationship System
DC	direct current
DHS	U.S. Department of Homeland Security
DNA	Determination of NEPA Adequacy
DNI	direct normal insulation
DNL	day-night average sound level
DoD	U.S. Department of Defense
DOE	U.S. Department of Energy
DOI	U.S. Department of the Interior
DOL	U.S. Department of Labor
DOT	U.S. Department of Transportation
DRECP	California Desert Renewable Energy Conservation Plan
DSM	demand side management
DTC/C-AMA	Desert Training Center/California–Arizona Maneuver Area
DWMA	Desert Wildlife Management Area
EA	environmental assessment
ECAR	East Central Area Reliability Coordination Agreement
ECOS	Environmental Conservation Online System (USFWS)
EERE	Energy Efficiency and Renewable Energy (DOE)
Eg	band gap energy
EIA	Energy Information Administration
EIS	environmental impact statement
EISA	Energy Independence and Security Act of 2007
EMF	electromagnetic field
E.O.	Executive Order

EPA	U.S. Environmental Protection Agency
EPRI	Electric Power Research Institute
EQIP	Environmental Quality Incentives Program
ERCOT	Electric Reliability Council of Texas
ERO	Electric Reliability Organization
ERS	Economic Research Service
ESA	Endangered Species Act of 1973
ESRI	Environmental Systems Research Institute
FAA	Federal Aviation Administration
FBI	Federal Bureau of Investigation
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Map
FLPMA	Federal Land Policy and Management Act of 1976
FONSI	Finding of No Significant Impact
FR	*Federal Register*
FRCC	Florida Reliability Coordinating Council
FSA	Final Staff Assessment
FTE	full-time equivalent
FY	fiscal year
G&TM	Generation and Transmission Modeling
GCRP	U.S. Global Climate Research Program
GDA	generation development area
GHG	greenhouse gas
GIS	geographic information system
GPS	global positioning system
GTM	Generation and Transmission Model
GUAC	Groundwater Users Advisory Council
GWP	global warming potential
HA	herd area
HAP	hazardous air pollutant
HAZCOM	hazard communication
HCE	heat collection element
HCP	Habitat Conservation Plan
HMA	Herd Management Area
HMMH	Harris Miller Miller & Hanson, Inc.
HRSG	heat recovery steam generator
HSPD	Homeland Security Presidential Directive
HTF	heat transfer fluid
HVAC	heating, ventilation, and air-conditioning

I	Interstate
IARC	International Agency for Research on Cancer
IBA	important bird area
ICE	internal combustion engine
ICWMA	Imperial County Weed Management Area
IEC	International Electrochemical Commission
IFR	instrument flight rule
IID	Imperial Irrigation District
IM	Instruction Memorandum
IMPS	Iron Mountain Pumping Station
IMS	interim mitigation strategy
INA	Irrigation Non-Expansion Area
IOP	Interagency Operating Procedure
IOU	investor-owned utility
IPPC	Intergovernmental Panel on Climate Change
ISA	Independent Science Advisor; Instant Study Area
ISB	Intermontane Seismic Belt
ISCC	integrated solar combined cycle
ISDRA	Imperial Sand Dunes Recreation Area
ISEGS	Ivanpah Solar Energy Generating System
ITP	incidental take permit
IUCNNR	International Union for Conservation of Nature and Natural Resources
IUCNP	International Union for Conservation of Nature Pakistan
KGA	known geothermal resources area
KML	keyhole markup language
KOP	key observation point
KSLA	known sodium leasing area
LCC	Landscape Conservation Cooperative
LCOE	levelized cost of energy
L_{dn}	day-night average sound level
LDWMA	Low Desert Weed Management Area
L_{eq}	equivalent sound pressure level
LLA	limited land available
LLRW	low-level radioactive waste (waste classification)
LRG	Lower Rio Grande
LSA	lake and streambed alteration
LSE	load-serving entity
LTVA	long-term visitor area
MAAC	Mid-Atlantic Area Council
MAIN	Mid-Atlantic Interconnected Network
MAPP	methyl acetylene propadiene stabilizer; Mid-Continent Area Power Pool
MCAS	Marine Corps Air Station
MCL	maximum contaminant level

MFP	Management Framework Plan
MIG	Minnesota IMPLAN Group
MLA	maximum land available
MOA	military operating area
MOU	Memorandum of Understanding
MPDS	maximum potential development scenario
MRA	Multiple Resource Area
MRI	Midwest Research Institute
MRO	Midwest Reliability Organization
MSDS	Material Safety Data Sheet
MSL	mean sea level
MTR	military training route
MWA	Mojave Water Agency
MWD	Metropolitan Water District
MWMA	Mojave Weed Management Area
NAAQS	National Ambient Air Quality Standards
NADP	National Atmospheric Deposition Program
NAGPRA	Native American Graves Protection and Repatriation Act
NAHC	Native American Heritage Commission (California)
NAIC	North American Industrial Classification System
NASA	National Aeronautics and Space Administration
NCA	National Conservation Area
NCCAC	Nevada Climate Change Advisory Committee
NCDC	National Climatic Data Center
NCES	National Center for Education Statistics
NDCNR	Nevada Department of Conservation and Natural Resources
NDEP	Nevada Division of Environmental Protection
NDOT	Nevada Department of Transportation
NDOW	Nevada Department of Wildlife
NDWP	Nevada Division of Water Planning
NDWR	Nevada Division of Water Resources
NEAP	Natural Events Action Plan
NEC	National Electric Code
NED	National Elevation Database
NEP	Natural Events Policy
NEPA	National Environmental Policy Act of 1969
NERC	North American Electricity Reliability Corporation
NHA	National Heritage Area
NHNM	National Heritage New Mexico
NHPA	National Historic Preservation Act of 1966
NID	National Inventory of Dams
NM DOT	New Mexico Department of Transportation
NLCS	National Landscape Conservation System
NMAC	*New Mexico Administrative Code*
NMBGMR	New Mexico Bureau of Geology and Mineral Resources

NMDGF	New Mexico Department of Game and Fish
NMED	New Mexico Environment Department
NMED-AQB	New Mexico Environment Department-Air Quality Board
NMFS	National Marine Fisheries Service
NMOSE	New Mexico Office of the State Engineer
NMSU	New Mexico State University
NNHP	Nevada Natural Heritage Program
NNL	National Natural Landmark
NNSA	National Nuclear Security Administration
NOA	Notice of Availability
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NP	National Park
NPL	National Priorities List
NPS	National Park Service
NRA	National Recreation Area
NRCS	Natural Resources Conservation Service
NREL	National Renewable Energy Laboratory
NRHP	*National Register of Historic Places*
NRS	*Nevada Revised Statutes*
NSC	National Safety Council
NSO	no surface occupancy
NSTC	National Science and Technology Council
NTS	Nevada Test Site
NTTR	Nevada Test and Training Range
NVCRS	Nevada Cultural Resources Inventory System
NV DOT	Nevada Department of Transportation
NWCC	National Wind Coordinating Committee
NWI	National Wetlands Inventory
NWPP	Northwest Power Pool
NWR	National Wildlife Refuge
NWSRS	National Scenic River System
O&M	operation and maintenance
ODFW	Oregon Department of Fish and Wildlife
OHV	off-highway vehicle
ONA	Outstanding Natural Area
ORC	organic Rankine cycle
OSE/ISC	Office of the State Engineer/Interstate Stream Commission
OSHA	Occupational Safety and Health Administration
OTA	Office of Technology Assessment
PA	Programmatic Agreement
PAD	Preliminary Application Document
PAH	polycyclic aromatic hydrocarbon

PAT	peer analysis tool
PCB	polychlorinated biphenyl
PCM	purchase change material
PCS	power conditioning system
PCU	power converting unit
PEIS	programmatic environmental impact statement
PFYC	potential fossil yield classification
PIER	Public Interest Energy Research
P.L.	Public Law
PLSS	Public Land Survey System
PM	particulate matter
$PM_{2.5}$	particulate matter with a mean aerodynamic diameter of 2.5 μm or less
PM_{10}	particulate matter with a mean aerodynamic diameter of 10 μm or less
POD	plan of development
POU	publicly owned utility
PPA	Power Purchase Agreement
PPE	personal protective equipment
PSD	Prevention of Significant Deterioration
PURPA	Public Utility Regulatory Policy Act
PV	photovoltaic
PVID	Palo Verde Irrigation District
PWR	public water reserve
QRA	qualified resource area
R&I	relevance and importance
RCI	residential, commercial, and industrial (sector)
RCRA	Resource Conservation and Recovery Act of 1976
RD&D	research, development, and demonstration; research, development, and deployment
RDBMS	Relational Database Management System
RDEP	Restoration Design Energy Project
REA	Rapid Ecoregional Assessment
REAT	Renewable Energy Action Team
REDI	Renewable Energy Development Infrastructure
ReEDS	Regional Energy Deployment System
REPG	Renewable Energy Policy Group
RETA	Renewable Energy Transmission Authority
RETAAC	Renewable Energy Transmission Access Advisory Committee
RETI	Renewable Energy Transmission Initiative
REZ	renewable energy zone
RF	radio frequency
RFC	Reliability First Corporation
RFDS	reasonably foreseeable development scenario
RGP	Rio Grande Project
RGWCD	Rio Grande Water Conservation District

RMP	Resource Management Plan
RMPA	Rocky Mountain Power Area
RMZ	Resource Management Zone
ROD	Record of Decision
ROI	region of influence
ROS	recreation opportunity spectrum
ROW	right-of-way
RPG	renewable portfolio goal
RPS	Renewable Portfolio Standard
RRC	Regional Reliability Council
RSEP	Rice Solar Energy Project
RSI	Renewable Systems Interconnection
RTTF	Renewable Transmission Task Force
RV	recreational vehicle
SAAQS	State Ambient Air Quality Standards
SAMHSA	Substance Abuse and Mental Health Services Administration
SCADA	supervisory control and data acquisition
SCE	Southern California Edison
SCRMA	Special Cultural Resource Management Area
SDRREG	San Diego Regional Renewable Energy Group
SDWA	Safe Drinking Water Act of 1974
SEGIS	Solar Energy Grid Integration System
SEGS	Solar Energy Generating System
SEI	Sustainable Energy Ireland
SEIA	Solar Energy Industrial Association
SES	Stirling Energy Systems
SETP	Solar Energy Technologies Program (DOE)
SEZ	solar energy zone
SHPO	State Historic Preservation Office(r)
SIP	State Implementation Plan
SLRG	San Luis & Rio Grande
SMA	Special Management Area
SMP	suggested management practice
SNWA	Southern Nevada Water Authority
SPP	Southwest Power Pool
SRMA	Special Recreation Management Area
SSA	Socorro Seismic Anomaly
SSI	self-supplied industry
ST	solar thermal
STG	steam turbine generator
SUA	special use airspace
SWAT	Southwest Area Transmission
SWIP	Southwest Intertie Project
SWPPP	Stormwater Pollution Prevention Plan
SWReGAP	Southwest Regional Gap Analysis Project

TAP	toxic air pollutant
TCC	Transmission Corridor Committee
TDS	total dissolved solids
TEPPC	Transmission Expansion Planning Policy Committee
TES	thermal energy storage
TSA	Transportation Security Administration
TSCA	Toxic Substances Control Act of 1976
TSDF	treatment, storage, and disposal facility
TSP	total suspended particulates
UACD	Utah Association of Conservation Districts
UBWR	Utah Board of Water Resources
UDA	Utah Department of Agriculture
UDEQ	Utah Department of Environmental Quality
UDNR	Utah Department of Natural Resources
UDOT	Utah Department of Transportation
UDWQ	Utah Division of Water Quality
UDWR	Utah Division of Wildlife Resources
UGS	Utah Geological Survey
UNEP	United Nations Environmental Programme
UNPS	Utah Native Plant Society
UP	Union Pacific
UREZ	Utah Renewable Energy Zone
USACE	U.S. Army Corps of Engineers
USC	*United States Code*
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
Utah DWR	Utah Division of Water Rights
UTTR	Utah Test and Training Range
UWS	Underground Water Storage, Savings and Replenishment Act
VACAR	Virginia-Carolinas Subregion
VCRS	Visual Contrast Rating System
VFR	visual flight rule
VOC	volatile organic compound
VRI	Visual Resource Inventory
VRM	Visual Resource Management
WA	Wilderness Area
WAPA	Western Area Power Administration
WECC	Western Electricity Coordinating Council
WECC CAN	Western Electricity Coordinating Council – Canada
WEG	wind erodibility group
WGA	Western Governors' Association

WGFD	Wyoming Game and Fish Department
WHA	wildlife habitat area
WHO	World Health Organization
WRAP	Water Resources Allocation Program; Western Regional Air Partnership
WRCC	Western Regional Climate Center
WREZ	Western Renewable Energy Zones
WRRI	Water Resources Research Institute
WSA	Wilderness Study Area
WSC	wildlife species of special concern
WSMR	White Sands Missile Range
WSR	Wild and Scenic River
WSRA	Wild and Scenic Rivers Act of 1968
WWII	World War II
YPG	Yuma Proving Ground
ZITA	zone identification and technical analysis
ZLD	zero liquid discharge

CHEMICALS

CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
H_2S	hydrogen sulfide
Hg	mercury
N_2O	nitrous oxide
NH_3	ammonia
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
O_3	ozone
Pb	lead
SF_6	sulfur hexafluoride
SO_2	sulfur dioxide
SO_x	sulfur oxides

UNITS OF MEASURE

ac-ft	acre-foot (feet)
bhp	brake horsepower
°C	degree(s) Celsius
cf	cubic foot (feet)
cfs	cubic foot (feet) per second
cm	centimeter(s)
dB	decibel(s)
dBA	A-weighted decibel(s)
°F	degree(s) Fahrenheit
ft	foot (feet)
ft^2	square foot (feet)
ft^3	cubic foot (feet)
g	gram(s)
gal	gallon(s)
GJ	gigajoule(s)
gpcd	gallon per capita per day
gpd	gallon(s) per day

gpm	gallon(s) per minute
GW	gigawatt(s)
GWh	gigawatt hour(s)
GWh/yr	gigawatt hour(s) per year
h	hour(s)
ha	hectare(s)
Hz	hertz
in.	inch(es)
J	joule(s)
K	degree(s) Kelvin
kcal	kilocalorie(s)
kg	kilogram(s)
kHz	kilohertz
km	kilometer(s)
km^2	square kilometer(s)
kPa	kilopascal(s)
kV	kilovolt(s)
kVA	kilovolt-ampere(s)
kW	kilowatt(s)
kWh	kilowatt-hour(s)
kWp	kilowatt peak
L	liter(s)
lb	pound(s)
m	meter(s)
m^2	square meter(s)
m^3	cubic meter(s)
mg	milligram(s)
Mgal	million gallons
mi	mile(s)
mi^2	square mile(s)
min	minute(s)
mm	millimeter(s)
MMt	million metric ton(s)
MPa	megapascal(s)
mph	mile(s) per hour
MW	megawatt(s)
MWe	megawatt(s) electric
MWh	megawatt-hour(s)
ppm	part(s) per million
psi	pound(s) per square inch
psia	pound(s) per square inch absolute
rpm	rotation(s) per minute
s	second(s)
scf	standard cubic foot (feet)
TWh	terawatt hours
VdB	vibration velocity decibel(s)
W	watt(s)
yd^2	square yard(s)
yd^3	cubic yard(s)
yr	year(s)
µg	microgram(s)
µm	micrometer(s)

ENGLISH/METRIC AND METRIC/ENGLISH EQUIVALENTS

The following table lists the appropriate equivalents for English and metric units.

Multiply	By	To Obtain
English/Metric Equivalents		
acres	0.004047	square kilometers (km^2)
acre-feet (ac-ft)	1,234	cubic meters (m^3)
cubic feet (ft^3)	0.02832	cubic meters (m^3)
cubic yards (yd^3)	0.7646	cubic meters (m^3)
degrees Fahrenheit (ºF) –32	0.5555	degrees Celsius (ºC)
feet (ft)	0.3048	meters (m)
gallons (gal)	3.785	liters (L)
gallons (gal)	0.003785	cubic meters (m^3)
inches (in.)	2.540	centimeters (cm)
miles (mi)	1.609	kilometers (km)
miles per hour (mph)	1.609	kilometers per hour (kph)
pounds (lb)	0.4536	kilograms (kg)
short tons (tons)	907.2	kilograms (kg)
short tons (tons)	0.9072	metric tons (t)
square feet (ft^2)	0.09290	square meters (m^2)
square yards (yd^2)	0.8361	square meters (m^2)
square miles (mi^2)	2.590	square kilometers (km^2)
yards (yd)	0.9144	meters (m)
Metric/English Equivalents		
centimeters (cm)	0.3937	inches (in.)
cubic meters (m^3)	0.00081	acre-feet (ac-ft)
cubic meters (m^3)	35.31	cubic feet (ft^3)
cubic meters (m^3)	1.308	cubic yards (yd^3)
cubic meters (m^3)	264.2	gallons (gal)
degrees Celsius (ºC) +17.78	1.8	degrees Fahrenheit (ºF)
hectares (ha)	2.471	acres
kilograms (kg)	2.205	pounds (lb)
kilograms (kg)	0.001102	short tons (tons)
kilometers (km)	0.6214	miles (mi)
kilometers per hour (kph)	0.6214	miles per hour (mph)
liters (L)	0.2642	gallons (gal)
meters (m)	3.281	feet (ft)
meters (m)	1.094	yards (yd)
metric tons (t)	1.102	short tons (tons)
square kilometers (km^2)	247.1	acres
square kilometers (km^2)	0.3861	square miles (mi^2)
square meters (m^2)	10.76	square feet (ft^2)
square meters (m^2)	1.196	square yards (yd^2)

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9 AFFECTED ENVIRONMENT AND IMPACT ASSESSMENT FOR PROPOSED SOLAR ENERGY ZONES IN CALIFORNIA

9.1 IMPERIAL EAST

9.1.1 Background and Summary of Impacts

9.1.1.1 General Information

The proposed Imperial East solar energy zone (SEZ) has a total area of 5,722 acres (23.2 km^2) and is located in Imperial County in southeastern California, near the United States–Mexico border (Figure 9.1.1.1-1). In 2008, the Imperial County population was 180,493, while the two-county region—Imperial County and Yuma County, Arizona—surrounding the SEZ had a total population of 387,798. Calexico (38,344) is located about 15 mi (24 km) to the west along State Route 98, and El Centro (40,083) lies 19 mi (31 km) to the west along Interstate 8 (I-8) in Imperial County. I-8 runs east–west along the northeast edge of the proposed SEZ, while State Route 98, a two-lane highway, passes through the southern edge. San Diego lies 120 mi (194 km) to the west, and Yuma, 29 mi (47 km) to the east via I-8. A branch line of the Union Pacific Railroad (UP) serves Calexico and El Centro. Four small public airports lie within 34 mi (55 km) of the proposed SEZ.

A 115-kV transmission line intersects the southwest corner of the SEZ, and a 500-kV line is located about 0.4 mi (0.6 km) to the south, running east–west. It is assumed that the existing 115-kV transmission line could potentially provide access from the SEZ to the transmission grid (see Section 9.1.1.2).

As of February 2010, two solar project applications were pending in the SEZ (Resseguie 2010). Active pending solar lease applications within the SEZ are described in Section 9.1.22 and are shown in Figure 9.1.22.2-1; the entire SEZ area is included in the lease application areas. There is an operating geothermal plant about 3 mi (2.4 km) northwest of the SEZ.

The proposed Imperial East SEZ lies in the East Mesa, which consists of gravel flats within the California Desert Conservation Area (CDCA) within the Sonoran Desert. Surface elevations range from 75 to 120 ft (22.9 to 36.6 m). Scrubland vegetation reflects the arid climate, which produces an annual average rainfall of about 3 to 4 in. (7.6 to 10.2 cm). The Imperial Valley groundwater basin underlies the area. The All-American Canal runs parallel to the southern boundary of the SEZ, about 0.3 mi (0.5 km) from the boundary. Two hydropower facilities exist along the canal, along with associated dams and substations. Little commercial or industrial activity exists in the surrounding area, while agricultural areas lie about 3 mi (5 km) to the west of the SEZ, across the border in Mexico. The Lake Cahuilla Area of Critical Environmental Concern (ACEC), protected for its prehistoric resources, is located adjacent to the western boundary of the SEZ. The East Mesa ACEC, protected for both wildlife habitat and prehistoric resources, is located on the northeast boundary. The Imperial Sand Dunes Recreation

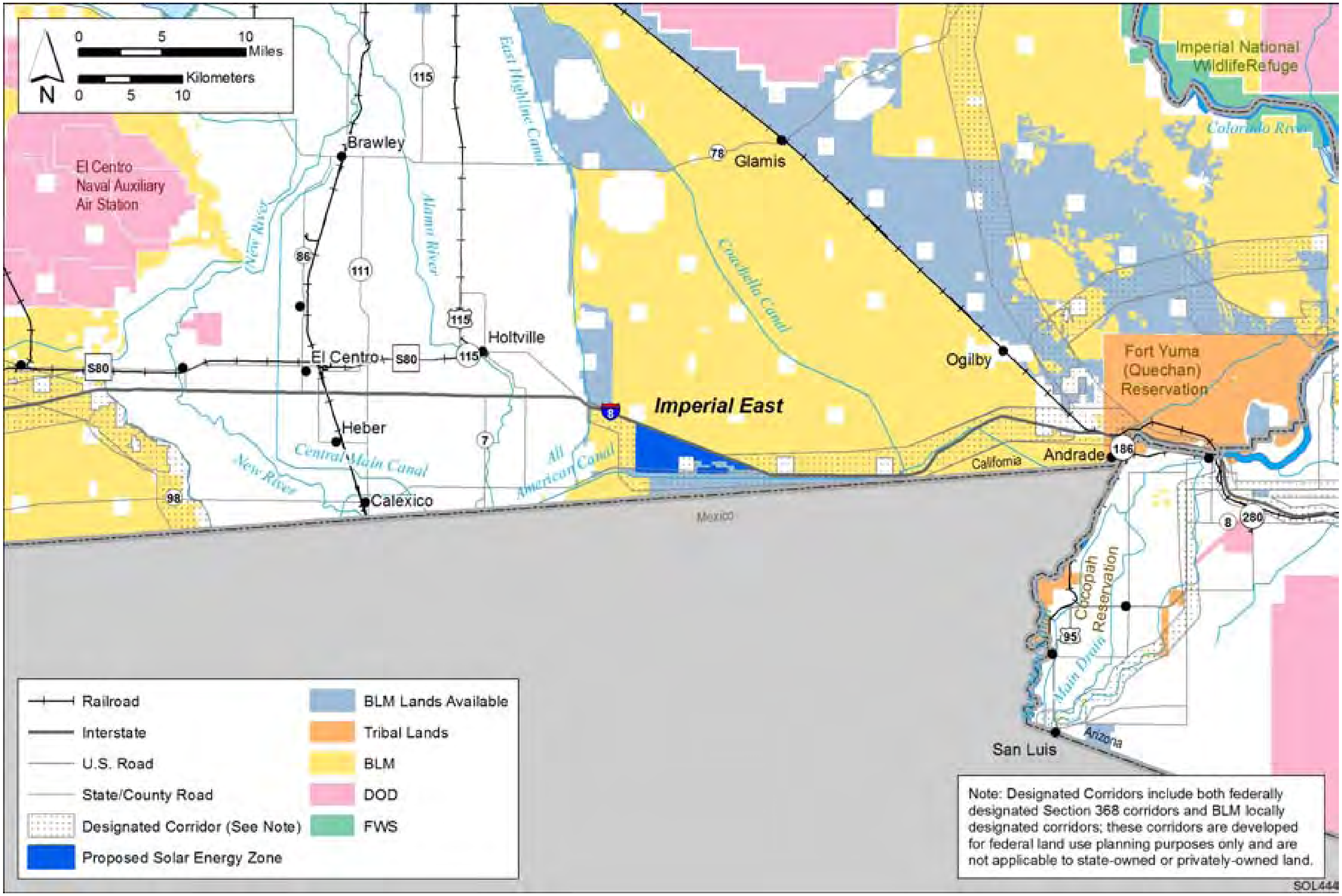

FIGURE 9.1.1.1-1 Proposed Imperial East SEZ

Area (ISDRA) and National Natural Landmark (NNL), with its northern section protected in the North Algodones ACEC and Wilderness Area (WA), is located approximately 8 mi (12.9 km) east–northeast of the SEZ; this is the largest mass of sand dunes in California (BLM 2010a).

The proposed Imperial East SEZ and other relevant information are shown in Figure 9.1.1.1-1. The criteria used to identify the SEZ as an appropriate location for solar development included proximity to existing transmission lines or designated corridors, proximity to existing roads, a slope of generally less than 2%, and an area of more than 2,500 acres (10 km^2). In addition, the area was identified as being relatively free of other types of conflicts, such as USFWS-designated critical habitat for threatened and endangered species, Areas of Critical Environmental Concern (ACECs), Special Recreation Management Areas (SRMAs), and National Landscape Conservation System (NLCS) lands (see Section 2.2.2.2 for the complete list of exclusions). Although these classes of restricted lands were excluded from the proposed Imperial East SEZ, other restrictions might be appropriate. The analyses in the following sections evaluate the affected environment and potential impacts associated with utility-scale solar energy development in the proposed SEZ for important environmental, cultural, and socioeconomic resources.

As initially announced in the *Federal Register* on June 30, 2009, the proposed Imperial East SEZ encompassed 12,830 acres (52 km^2). Subsequent to the study area scoping period, the Imperial East boundaries were changed substantially to exclude lands along the All-American Canal that are currently administered by the U.S. Bureau of Reclamation (BOR). The revised SEZ is approximately 7,108 acres (29 km^2) smaller than the original SEZ area as published in June 2009.

9.1.1.2 Development Assumptions for the Impact Analysis

Maximum development of the proposed Imperial East SEZ was assumed to be 80% of the total SEZ area over a period of 20 years, a maximum of 4,578 acres (18.5 km^2). These values are shown in Table 9.1.1.2-1, along with other development assumptions. Full development of the Imperial East SEZ would allow development of facilities with an estimated total of 509 MW of electrical power capacity if power tower, dish engine, or photovoltaic (PV) technologies were used, assuming 9 acres/MW (0.04 km^2/MW) of land required, and an estimated 916 MW of power if solar trough technologies were used, assuming 5 acres/MW (0.02 km^2/MW) of land required.

Availability of transmission from SEZs to load centers will be an important consideration for future development in SEZs. The nearest existing transmission line is a 115-kV line adjacent to the SEZ. It is possible that this existing line could be used to provide access from the SEZ to the transmission grid, but the 115-kV capacity of that line would be inadequate for 509 to 916 MW of new capacity (note: a 500-kV line can accommodate approximately the load of one 700-MW facility). At full build-out capacity, it is clear that new transmission lines and/or upgrades of existing transmission lines would be required to bring electricity from the proposed Imperial East SEZ to load centers; however, at this time the location and size of such new transmission facilities are unknown. Generic impacts of transmission and associated

TABLE 9.1.1.2-1 Proposed Imperial East SEZ—Development Acreages, Maximum Solar MW Output, Access Roads, and Transmission Line ROWs

Total Acreage and Assumed Developed Acreage (80% of Total)	Assumed Maximum SEZ Output for Various Solar Technologies	Distance to Nearest State, U.S., or Interstate Highway	Distance and Capacity of Nearest Existing Transmission Line	Assumed Area of Transmission Line ROW and Road ROW	Distance to Nearest Designated Transmission Corridor[d]
5,722 acres and 4,578 acres[a]	509 MW[b] 916 MW[c]	Adjacent (State Route 98)	Within SEZ, and 1151 kV	0 acres and 0 acres	Crosses SEZ[e]

[a] To convert acres to km^2, multiply by 0.004047.

[b] Maximum power output if the SEZ were fully developed using power tower, dish engine, or PV technologies, assuming 9 acres/MW (0.04 km^2/MW) of land required.

[c] Maximum power output if the SEZ were fully developed using solar trough technologies, assuming 5 acres/MW (0.02 km^2/MW) of land required.

[d] BLM-designated corridors are developed for federal land use planning purposes only and are not applicable to state-owned or privately owned land.

[e] A Section 368 federally designated 2-mi (3.2-km) wide energy corridor crosses the SEZ.

infrastructure construction and of line upgrades for various resources are discussed in Chapter 5. Project-specific analyses would need to identify the specific impacts of new transmission construction and line upgrades for any projects proposed within the SEZ.

For the purposes of analysis in this PEIS, it was assumed that the existing 115-kV transmission line that intersects the southwest corner of the SEZ could provide access to the transmission grid, and thus no additional acreage disturbance for transmission line access was assessed. Access to the existing transmission line was assumed, without additional information on whether this line would be available for connection of future solar facilities. If a connecting transmission line were constructed in the future to connect facilities within the SEZ to a different off-site grid location from the one assumed here, site developers would need to determine the impacts from construction and operation of that line. In addition, developers would need to determine the impacts of line upgrades if they were needed.

Existing road access to the proposed Imperial East SEZ should be adequate to support construction and operation of solar facilities, because State Route 98 passes along the southern edge of the SEZ (although I-8 also runs along the northern boundary of the SEZ, no access to the SEZ from the interstate is available). Because of the site access provided by State Route 98, no additional road construction outside of the SEZ is assumed to be required to support solar development.

9.1.1.3 Summary of Major Impacts and SEZ-Specific Design Features

In this section, the impacts and SEZ-specific design features assessed in Sections 9.1.2 through 9.1.21 for the proposed Imperial East SEZ are summarized in tabular form. Table 9.1.1.3-1 is a comprehensive list of the impacts discussed in these sections; the reader may reference the applicable sections for detailed support of the impact assessment. Section 9.1.22 discusses potential cumulative impacts from solar energy development in the proposed SEZ.

Only those design features specific to the Imperial East SEZ are included in Sections 9.1.2 through 9.1.21 and in the summary table. The detailed programmatic design features for each resource area to be required under BLM's Solar Energy Program are presented in Appendix A, Section A.2.2. These programmatic design features would also be required for development in this and other SEZs.

TABLE 9.1.1.3-1 Summary of Impacts of Solar Energy Development within the Proposed Imperial East SEZ and SEZ-Specific Design Features[a]

Resource Area	Environmental Impacts—Proposed Imperial East SEZ	SEZ-Specific Design Features
Lands and Realty	Full development of the SEZ for utility-scale solar energy production (80% of the total area) could disturb up to 4,578 acres (18.5 km^2) and would establish a large industrial area that would exclude many existing and potential uses of the land, perhaps in perpetuity. Since the SEZ is largely undeveloped and rural, utility-scale solar energy development would be a new and discordant land use to the area.	None.
	640 acres (2.6 km^2) of private land and approximately 980 acres (4 km^2) of BOR land located within or adjacent to the exterior boundaries of the SEZ, with land owner agreement, could be developed in the same or a complementary manner as the public lands.	None.
	A designated Section 368 energy corridor covers about 80% of the SEZ, potentially leaving less than 1,000 acres (4 km^2) available for solar development. Because of technical constraints, solar development could not occur under electrical transmission lines or over pipelines; thus it appears that either the transmission corridor would have to be modified or solar development precluded within the transmission corridor.	None.
Specially Designated Areas and Lands with Wilderness Characteristics	Lake Cahuilla ACECs C and D could be exposed to additional human traffic, resulting in an increased risk of loss of prehistoric resources.	Once construction of solar energy facilities begins, the BLM would monitor to determine whether increases in traffic in the ACECs occurs and whether additional management measures are required to protect the resources in these areas.
Rangeland Resources: Livestock Grazing	None.	None.
Rangeland Resources: Wild Horses and Burros	None.	None.

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TABLE 9.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Imperial East SEZ	SEZ-Specific Design Features
Recreation	Recreational users would be excluded from the SEZ.	None.
Military and Civilian Aviation	The development of any solar energy or transmission facilities that encroach into the airspace of MTRs/SUAs would create safety issues and could conflict with military training activities.	None.
	Power tower facilities could pose some hazard to the operation of the Mexicali Airport in Mexico.	Should power tower facilities be proposed for the SEZ, coordination across the international border should be required to ensure that there is no airspace management concern associated with the Mexicali Airport.
Geologic Setting and Soil Resources	Impacts on soil resources would occur mainly as a result of ground-disturbing activities (e.g., grading, excavating, and drilling) during the construction phase. Impacts include soil compaction, soil horizon mixing, soil erosion and deposition by wind, soil erosion by water and surface runoff, sedimentation, and soil contamination. These impacts may be impacting factors for other resources (e.g., air quality, water quality, and vegetation).	None.
Minerals (fluids, solids, and geothermal resources)	About 60% of the SEZ is included within a KGRA. Designation of the SEZ would prevent surface occupancy to develop geothermal resources in the KGRA.	To protect the option for geothermal leasing under solar energy facilities, ROW authorizations for solar energy facilities should specifically note the potential for geothermal leasing with no surface occupancy stipulations.

TABLE 9.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Imperial East SEZ	SEZ-Specific Design Features
Water Resources	Ground-disturbance activities (affecting 35 to 52% of the total area in the peak construction year) could affect surface water quality due to surface runoff, sediment erosion, and contaminant spills.	Water resource analysis indicates that wet-cooling options would not be feasible. Other technologies should incorporate water conservation measures.
	Construction activities may require up to 2,074 ac-ft (2.6 million m^3) of water during peak construction year. Construction activities would generate as much as 74 ac-ft (91,300 m^3) of sanitary wastewater.	Land disturbance activities should avoid impacts in the vicinity of the existing and mitigation wetlands located along the southern boundary of the site.
	Assuming full development of the SEZ, the following amounts of water would be used during operations: • For parabolic trough facilities (916-MW capacity), 654 to 1,387 ac-ft/yr (806,700 to 1.7 million m^3/yr) for dry-cooled systems; and 4,591 to 13,746 ac-ft/yr (5.7 million to 17 million m^3/yr) for wet-cooled systems; • For power tower facilities (509-MW capacity), 362 to 769 ac-ft/yr (446,500 to 948,500 m^3/yr) for dry-cooled systems; and 2,549 to 7,635 ac-ft/yr (3.1 million to 9.4 million m^3/yr) for wet-cooled systems; • For dish engine facilities (509-MW capacity), 260 ac-ft/yr (320,700 million m^3/yr); and • For PV facilities (509-MW capacity), 26 ac-ft/yr (312,100 million m^3/yr). Assuming full development of the SEZ, operations would generate up to 13 ac-ft/yr (16,000 million m^3/yr) of sanitary wastewater and up to 260 ac-ft/yr (320,700 million m^3/yr) of blowdown water.	During site characterization, hydrologic investigations would need to identify 100-year floodplains and potential jurisdictional water bodies subject to Clean Water Act Section 404 permitting. Siting of solar facilities and construction activities should avoid areas identified as being within a 100-year floodplain. During site characterization, coordination and permitting with CDFG regarding California's Lake and Streambed Alteration Program would be required for any proposed alterations to surface water features (both perennial and ephemeral). The groundwater-permitting process should be in compliance with the Imperial County groundwater ordinance. Groundwater monitoring and production wells should be constructed in accordance with standards set forth by the State of California and Imperial County.

TABLE 9.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Imperial East SEZ	SEZ-Specific Design Features
Water Resources *(Cont.)*	Runoff of water and sediments from the proposed SEZ could adversely affect the existing wetlands along the AAC and the mitigation wetlands associated with the AAC lining project. High TDS values of groundwater could produce water that is nonpotable and corrosive to infrastructure.	Stormwater management plans and BMPs should comply with standards developed by the California Stormwater Quality Association. Water for potable uses should meet or be treated to meet the water quality standards of the California Safe Drinking Water Act.
Vegetation[b]	Up to 80% of the SEZ (4,578 acres [18.5 km^2]) would be cleared of vegetation; dune habitats would likely be affected; re-establishment of plant communities in disturbed areas would likely be very difficult because of the arid conditions. Noxious weeds could become established in disturbed areas and colonize adjacent undisturbed habitats, thus reducing restoration success and potentially resulting in widespread habitat degradation. Grading could result in direct impacts on the wetlands within the SEZ and could potentially alter wetland plant communities and affect wetland function. In addition, project-related reductions in groundwater inflows to wetlands inside and outside the SEZ could alter wetland hydrologic characteristics and plant communities.	An Integrated Vegetation Management Plan, addressing invasive species control, and an Ecological Resources Mitigation and Monitoring Plan, addressing habitat restoration should be approved and implemented to increase the potential for successful restoration of Sonoran Desert habitats, such as desert scrub and dunes, and minimize the potential for the spread of invasive species. Invasive species control should focus on biological and mechanical methods where possible to reduce the use of herbicides. Wetland, riparian habitats, and desert dry washes that occur primarily within the western and southern portions of the SEZ, and sand dune habitats and sand transport areas, primarily in the northern and eastern portions of the SEZ, should be avoided to the extent practicable, and any impacts minimized or mitigated. A buffer area should be maintained around wetlands, riparian areas, and dry washes to reduce the potential for impacts on wetlands on or near the SEZ. Appropriate engineering controls should be used to minimize impacts on these areas resulting from surface water runoff, erosion, sedimentation, altered

TABLE 9.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Imperial East SEZ	SEZ-Specific Design Features
Vegetation[b] (*Cont.)*		hydrology, accidental spills, or fugitive dust deposition to these habitats. Appropriate buffers and engineering controls would be determined through agency consultation. An appropriate buffer shall be maintained between project impacts and the wetland south of the Imperial Valley SEZ to ensure all impacts from construction, operations, and maintenance of solar facilities do not impair the current functions and values associated with wetland resource, including habitat support for sensitive species. Groundwater withdrawals should be limited to reduce the potential for indirect impacts on wetland habitats that are associated with groundwater discharge, such as the wetlands near the AAC and EHC.
Wildlife: Amphibians and Reptiles[b]	The red-spotted toad is the main amphibian expected to occur within the Imperial East SEZ, but its occurrence within the SEZ would be spatially limited. Several other amphibian species could inhabit the AAC immediately south of the SEZ and the EHC located about 2.8 mi (4.5 km) west of the SEZ. These species, which include the bullfrog, Colorado River toad, Rio Grande leopard frog, and Woodhouse's toad, would not be expected to occur within the SEZ. Twenty-seven reptile species (the desert tortoise, which is a federally listed species; 12 lizards; and 14 snakes) could occur within the SEZ. Direct impacts on amphibian and reptile species from SEZ development would be small. With implementation of proposed design features, indirect impacts would be expected to be negligible.	The potential for indirect impacts on several amphibian species could be reduced by maximizing the distance between solar energy development and the All-American Canal. Avoid wetlands located along the southern boundary of the SEZ, including those that are planned to be created or enhanced in the area.

TABLE 9.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Imperial East SEZ	SEZ-Specific Design Features
Wildlife: Birds[b]	Nearly 90 species of birds have a range that encompasses the SEZ. However, habitats for about 40 of these species either do not occur on or are limited within the SEZ (e.g., habitat for waterfowl and wading birds). Direct impacts from habitat disturbance and long-term habitat reduction/ fragmentation would be small. Other impacts on birds could result from collision with vehicles and buildings, surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, noise, lighting, spread of invasive species, accidental spills, and harassment. Indirect impacts on areas outside the SEZ (e.g., impacts caused by dust generation, erosion, and sedimentation) are expected to be negligible with implementation of proposed design features.	Pre-disturbance surveys should be conducted within the SEZ for bird species listed under the Migratory Bird Treaty Act. Impacts on potential nesting habitat of these species should be avoided particularly during the nesting season. Pre-disturbance surveys should be conducted within the SEZ for the following desert bird focal species: ash-throated flycatcher, black-tailed gnatcatcher, black-throated sparrow, burrowing owl, common raven, Costa's hummingbird, crissal thrasher, ladder-backed woodpecker, Le Conte's thrasher, phainopepla, and verdin. Impacts on potential nesting habitat of these species should be avoided. Plant species that positively influence the presence and abundance of the desert bird focal species should be avoided to the extent practicable. These species include Goodding's willow, yucca, Joshua tree, mesquite, honey mesquite, screwbean, desert mistletoe, big saltbush, smoketree, and catclaw acacia. Wetland habitats along the southern boundary of the SEZ boundary should be avoided to the extent practicable. Take of golden eagles and other raptors should be avoided. Mitigation regarding the golden eagle should be developed in consultation with the USFWS and CDFG. A permit may be required under the Bald and Golden Eagle Protection Act.

TABLE 9.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Imperial East SEZ	SEZ-Specific Design Features
Wildlife: Birds[b] *(Cont.)*		Pre-disturbance surveys should be conducted within the SEZ for bird species listed under the Migratory Bird Treaty Act. Impacts on potential nesting habitat of these species should be avoided, particularly during the nesting season.
Wildlife: Mammals[b]	The bighorn sheep (a BLM sensitive species discussed below with the special status species) and mule deer are the only big game species whose ranges encompass the SEZ. The potential impacts on the mule deer are expected to be small. It is unlikely that impacts from solar energy development within the SEZ would represent an actual loss of occupied habitat for the mule deer, although direct impacts could occur to about 0.3% of potentially suitable habitat within the SEZ region. Direct impacts on small game, furbearers, and small mammals on the SEZ from habitat disturbance and long-term habitat reduction/fragmentation would be small, as 0.4% or less of potentially suitable habitats identified for the species would occur. Larger areas of suitable habitat for these species occur within the area of potential indirect effects immediately outside the SEZ.	Ensure that solar project development does not prevent mule deer free access to the unlined section of the All-American Canal.
Aquatic Biota[b]	No permanent water bodies or streams are present within the boundaries of the Imperial East SEZ. The wetlands and dry lakes present within the SEZ and the man-made AAC and EHC within the area of potential indirect effects could be affected by runoff of water and sediment from the SEZ.	None.

TABLE 9.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Imperial East SEZ	SEZ-Specific Design Features
Special Status Species[b]	Potentially suitable habitat for 35 special status species occurs in the affected area of the Imperial East SEZ. For all special status species, less than 1% of the potentially suitable habitat in the region would be directly affected by development.	Pre-disturbance surveys should be conducted within the SEZ to determine the presence and abundance of special status species. Disturbance to occupied habitats for these species should be avoided or minimized to the extent practicable. If avoiding or minimizing impacts on occupied habitats is not possible for some species, translocation of individuals from areas of direct effect or compensatory mitigation of direct effects on occupied habitats could reduce impacts. A comprehensive mitigation strategy for special status species that uses one or more of these options to offset the impacts of development should be developed in coordination with the appropriate federal and state agencies. Disturbance of sand dunes and sand transport systems, desert riparian, wash, and wetland habitats should be avoided or minimized to the extent practicable. Avoiding or minimizing disturbance of these habitats could reduce impacts on 30 special status species. As California fully protected species, direct and indirect impacts on the California black rail and Yuma clapper rail should be completely avoided. This includes the complete avoidance of occupied and potentially suitable wetlands on and in the vicinity of the SEZ (particularly those seepage wetlands and enhanced wetlands associated with the All-American Canal). Consultations with the CDFG are required to address the potential for impacts on these species as required under the CESA.

TABLE 9.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Imperial East SEZ	SEZ-Specific Design Features
Special Status Species[b] *(Cont.)*		Consultations with the USFWS and the CDFG should be conducted to address the potential for impacts on the Yuma clapper rail a species listed as endangered under the ESA and CESA. Consultation would identify an appropriate survey protocol, avoidance measures, and, if appropriate, reasonable and prudent alternatives, reasonable and prudent measures, and to determine any addition mitigation requirements beyond those already afforded to the Yuma clapper rail as a California fully protected species. . Coordination with the USFWS and CDFG should be conducted to address the potential for impacts on the flat-tailed horned lizard, a species that is proposed for listing under the ESA. Coordination would identify an appropriate survey protocol, avoidance measures, and, potentially, translocation or compensatory mitigation (if necessary). Harassment or disturbance of special status species and their habitats in the affected area should be mitigated. This can be accomplished by identifying any additional sensitive areas and implementing necessary protection measures based on consultation with the USFWS and CDFG.

TABLE 9.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Imperial East SEZ	SEZ-Specific Design Features
Air Quality and Climate	*Construction*: Temporary exceedances of AAQS for PM_{10} and $PM_{2.5}$ at the SEZ boundaries possible during construction; higher concentrations would be limited to the immediate area surrounding the SEZ boundary and would decrease quickly with distance. Modeling indicates that Class I PSD PM_{10} increments at the nearest federal Class I area (Joshua Tree NP), located about 69 mi (111 km) from the SEZ, would not be exceeded. Construction emissions from the engine exhaust from heavy equipment and vehicles could cause impacts on air-quality-related values (e.g., visibility and acid deposition), but such impacts would be temporary. *Operations*: Positive impacts due to avoided emission of air pollutants from combustion-related power generation: 0.8 to 1.5% of total emissions of SO_2, NO_x, Hg, and CO_2 from electric power systems in the state of California avoided (up to 205 tons/yr of SO_2, 337 tons/yr of NO_x, 0.003 tons/yr Hg, and 797,000 tons/yr CO_2).	None.
Visual Resources	The SEZ is in an area of low scenic quality, with numerous cultural disturbances already present. Residents, workers, and visitors to the area may experience visual impacts from solar energy facilities located within the SEZ (as well as any associated access roads and transmission lines) as they travel area roads. The residents nearest to the SEZ could be subjected to large visual impacts from solar energy development within the SEZ. Large visual impacts on the SEZ and surrounding lands within the SEZ viewshed due to major modification of the character of the existing landscape. Utility-scale solar energy development within the proposed Imperial East SEZ is unlikely to cause even moderate visual impacts on highly sensitive visual resource areas, the closest of which is more than 15 mi (24 km) from the SEZ. The closest community is beyond 10 mi (16 km) from the SEZ and is likely to experience minimal visual impacts from solar development within the SEZ.	None.

TABLE 9.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Imperial East SEZ	SEZ-Specific Design Features
Visual Resources *(Cont.)*	The SEZ is located within the CDCA. While renewable energy development is allowable within the SEZ under the CDCA management plan, substantial, non-mitigable visual impacts would occur within the CDCA in the SEZ and surrounding lands. Approximately 50 mi (80 km) of the auto tour route of the Juan Baptista de Anza Historic Trail is within the 25-mi (40-km) SEZ viewshed. More than 4 mi (6 km) of auto tour route is within the SEZ. Strong visual contrasts could be observed within and near the SEZ by travelers on the auto tour route. Approximately 52 mi (84 km) of I-8 is within the 25-mi (40-km) SEZ viewshed. Almost 8 mi (13 km) of I-8 abuts the SEZ. Strong visual contrasts could be observed within and near the SEZ by travelers on I-8. Approximately 33 mi (53 km) of State Route 98 is within the 25-mi (40-km) SEZ viewshed. More than 4 mi (6 km) of State Route 98 is within the SEZ. Strong visual contrasts could be observed within and near the SEZ by travelers on State Route 98. The communities of Holtville, Calexico, Heber, El Centro, and Imperial are located within the 5 to 25 mi (8 to 40 km) viewshed of the SEZ, although slight variations in topography and vegetation provide some screening. Visual impacts on these communities would be expected to be minimal.	

TABLE 9.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Imperial East SEZ	SEZ-Specific Design Features
Acoustic Environment	*Construction*: Estimated noise levels at the nearest residences located near the southwestern boundary (500 ft [150 m] from the SEZ boundary) would be about 69 dBA, well above the estimated background level of 50 dBA but below the Imperial County regulation of 75 dBA L_{eq} for construction noise. In addition, an estimated 65 dBA as L_{dn} at this location is well above the EPA guideline of 55 dBA for residential areas. *Operations*: Noise levels at the nearest residences from a parabolic trough or power tower facility would be about 50 dBA, which is equivalent to the estimated background level and the Imperial County regulation of 50 dBA daytime L_{eq}. If the operation were limited to daytime, 12 hours only, a noise level of about 52 dBA L_{dn} would be estimated for the nearest residences, which is below the EPA guidelines of 55 dBA L_{dn} for residential areas. However, in the case of 6-hour TES, the estimated nighttime sound level at the nearest residences would be 60 dBA L_{eq}, which is higher than the Imperial County regulation of 45 dBA nighttime L_{eq}. The combined day-night noise is estimated to be about 61 dBA as L_{dn}, which is higher than the EPA guideline of 55 dBA L_{dn} for residential areas. If 80% of the SEZ were developed with dish engine facilities, the estimated noise level of 54 dBA L_{eq} at the nearest residences would be higher than the Imperial County regulation of 50 dBA daytime L_{eq}. On the basis of 12-hour daytime operation, the estimated 54 dBA L_{dn} at these residences would be just below the EPA guideline of 55 dBA L_{dn} for residential areas.	Noise levels from cooling systems equipped with TES should be managed so that levels at the nearest residences to the southwest of the SEZ are kept within applicable guidelines. This could be accomplished in several ways, for example, through placing the power block approximately 1 to 2 mi (1.6 to 3 km) or more from residences, limiting operations to a few hours after sunset, and/or installing fan silencers. Dish engine facilities within the Imperial East SEZ should be located more than 1 to 2 mi (1.6 to 3 km) from nearby residences located southwest of the SEZ (i.e., the facilities should be located in the central or eastern portion of the proposed SEZ). Direct noise control measures applied to individual dish engine systems could also be used to reduce noise impacts at nearby residences.
Paleontological Resources	The potential for impacts on significant paleontological resources at the Imperial East SEZ is unknown, and a preliminary PFYC of Class 3b has been assigned. A more detailed investigation of the local geological deposits of the SEZ, and their location and potential depth is needed.	The need for and the nature of any SEZ-specific design features would depend on findings of paleontological surveys.

TABLE 9.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Imperial East SEZ	SEZ-Specific Design Features
Cultural Resources	Direct impacts on significant cultural resources could occur during site preparation and construction activities in the proposed SEZ; however, a cultural resource survey of the entire area of potential effect would first be required to identify archaeological sites, historic structures and features, and traditional cultural properties, and an evaluation would follow to determine whether any are eligible for listing in the NRHP. The SEZ is located just north of an area previously identified as having a high density of prehistoric and historic resources. It is also located very near to the Lake Cahuilla ACECs identified for their cultural values. At least two burials have been identified by the Native American Heritage Commission as being in or near the SEZ, indicating the possibility of others in the vicinity. The Yuma-San Diego Trail, connecting Pilot Knob with the Yuha Basin, also runs through the vicinity of the SEZ. Although few sites have been identified to date within the SEZ, impacts on cultural resources within the SEZ are likely to result from solar energy development.	Design features specific to the SEZ would be determined through consultation with the California SHPO and affected Tribes. Because of the possibility of burials in the vicinity of the proposed Imperial East SEZ and its location along the Yuma-San Diego Trail, it is recommended that for surveys conducted in the SEZ consideration be given to include Native American representatives in the development of survey designs and historic property treatment and monitoring plans.
Native American Concerns	It is possible that there will be Native American concerns about the potential for burials within the SEZ and visual impacts on landscape features, such as Pilot Knob, Picacho Peak, and Yuha Basin. The potential for impacts on the Yuma-San Diego Trail may also be of concern. As consultations continue, it is possible that other Native American concerns regarding solar energy development within the SEZ will emerge.	The need for and nature of SEZ-specific design features regarding potential issues of concern, such as burials, Yuma-San Diego Trail, and Pilot Knob, would be determined during government-to-government consultation with affected Tribes.
Socioeconomics	*Construction:* 209 to 2,769 total jobs; $12.1 million to $159.9 million income in ROI. *Operations:* 13 to 288 annual total jobs; $0.4 million to $9.8 million annual income in the ROI.	None.

TABLE 9.1.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Imperial East SEZ	SEZ-Specific Design Features
Environmental Justice	Potential impacts on minority populations could be incurred as a result of the construction and operation of solar development. Although impacts are likely to be small, there are minority populations, as defined by CEQ guidelines, within the 50-mi (80-km) radius around the boundary of the SEZ; thus any adverse impacts of solar projects could disproportionately affect minority populations. Because there are no low-income populations within the 50-mi (80-km) radius, according to CEQ guidelines, there would be no impacts on low-income populations.	None.
Transportation	The primary transportation impacts are anticipated to be from commuting worker traffic. California State Route 98 provides a regional traffic corridor that could experience moderate impacts for single projects that may have up to 1,000 daily workers, with an additional 2,000 vehicle trips per day (maximum).	None.

Abbreviations: AAC = All-American Canal; AAQS = ambient air quality standards; ACEC = Area of Critical Environmental Concern; BLM = Bureau of Land Management; BMP = best management practice; CDFG = California Department of Fish and Game; CEQ = Council on Environmental Quality; CESA= California Endangered Species Act; CO_2 = carbon dioxide; DoD = U.S. Department of Defense; EHC = East Highline Canal; EPA = U.S. Environmental Protection Agency; ESA = Endangered Species Act; Hg = mercury; KGRA = known geothermal resource area; L_{dn} = day-night average sound level; L_{eq} = equivalent sound pressure level; MTR = military training route; NO_x = nitrogen oxides; NP = National Park; NRHP = *National Register of Historic Places*; $PM_{2.5}$ = particulate matter with an aerodynamic diameter of 2.5 μm or less; PM_{10} = particulate matter with an aerodynamic diameter of 10 μm or less; PSD = prevention of significant deterioration; ROI = region of influence; ROW = right-of-way; SEZ = solar energy zone; SHPO = State Historic Preservation Office; SO_2 = sulfur dioxide; SUA = Special Use Airspace; TDS = total dissolved solids concentrations; TES = thermal energy storage; USFWS = U.S. Fish and Wildlife Service; VRM = visual resource management; WA = Wilderness Area.

[a] The detailed programmatic design features for each resource area to be required under BLM's Solar Energy Program are presented in Appendix A, Section A.2.2. These programmatic design features would be required for development in the proposed Imperial East SEZ.

[b] The scientific names of all plants, wildlife, aquatic biota, and special statute species are provided in Sections 9.1.10 through 9.1.12.

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9.1.2 Lands and Realty

9.1.2.1 Affected Environment

The 5,722-acre (23-km^2) proposed Imperial East SEZ is contained within a triangle bordered by I-8 and State Route 98 on the north and south, respectively, and by Lake Cahuilla ACEC C on the west. While the SEZ is largely devoid of development, the area to the south of the SEZ is developed with several transmission lines, the All-American Canal and associated facilities, including two hydropower drop structures, and the international boundary fence. The canal, which originates at the Colorado River, is a major conduit for irrigation and the municipal water supply for the Imperial Valley. Although the SEZ consists only of BLM-administered public lands, there are about 980 acres (4 km^2) of Reclamation Withdrawn[1] lands and 640 acres (2.6 km^2) of private lands within the external boundaries of the SEZ that are not part of the SEZ. The area is rural in character.

There are several existing right-of-way (ROW) authorizations in the SEZ, including authorizations for I-8 and State Route 98, a fiber optic line, a communications site, one short segment of a 115-kV transmission line, and a short segment of road leading to a housing complex and substation facilities just south of the SEZ. Also, two double wood pole transmission lines parallel the western border of the SEZ within the adjacent ACEC.

A ROW issued to the Imperial Irrigation District (IID) covers all public lands within the SEZ. This ROW documents that the IID holds a public water reserve on all lands in the SEZ. The IID can sell water for solar development.

A 2-mi (3-km) wide Section 368 (of the Energy Policy Act of 2005) energy corridor covers about 80% of the SEZ. This corridor was designated as an outcome of the West-wide Energy Corridor PEIS (DOE and DOI 2008).

Currently, there are two applications for ROWs for solar facilities within the Imperial East SEZ. These applications cover all of the land within the SEZ.

9.1.2.2 Impacts

9.1.2.2.1 Construction and Operations

Development of the proposed Imperial East SEZ for utility-scale solar energy production would establish a large industrial area that would exclude many existing and potential uses of the land, perhaps in perpetuity. Since the SEZ is undeveloped and rural, utility-scale solar energy

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[1] The term “Reclamation Withdrawal” means withholding an area of public land from the operation of the public land laws for the purpose of reserving the land for the use of the BOR. In general, this means that the BOR has first priority for use of the land for BOR projects. Other uses of the land may sometimes be approved with the concurrence of the BOR.

development would be a new and discordant land use to the area. It also is possible that the 640 acres (2.6 km^2) of private land located within the external boundary of the SEZ could be developed in the same or a complementary manner as the public lands with the concurrence of the landowner. The 980 acres (4 km^2) of Reclamation Withdrawn lands within the external boundaries of the SEZ are not part of the SEZ and are not analyzed for solar development as a part of this PEIS. It is possible that these lands also could be developed with concurrence from the BOR.

Current ROW authorizations on the SEZ would not be affected by solar energy development since they are prior rights. Should the proposed SEZ be identified as an SEZ in the Record of Decision (ROD) for this PEIS, the BLM would still have discretion to authorize additional ROWs in the area until solar energy development was authorized, and then future ROWs would be subject to the rights granted for solar energy development.

A designated Section 368 transmission corridor along I-8 covers 80% of the SEZ. It could limit future solar development to less than 1,000 acres (4 km^2) because to avoid technical or operational interference between transmission and solar energy facilities, solar energy facilities cannot be constructed under transmission lines or over pipelines. Because of the proximity to the international border and the East Mesa ACEC north of I-8, the transmission corridor capacity could be substantially reduced if the SEZ were fully developed for utility-scale solar energy production. Transmission capacity is becoming a more critical factor and reducing corridor capacity in this SEZ may have future, but currently unknown, consequences. This is an administrative conflict that can be addressed by the BLM, but there would be implications either for the amount of potential solar energy development or for the amount of transmission capacity that can be accommodated.

The existing public water reserve held by the IID, as documented in a ROW, would require close coordination with the district prior to development of on-site water supplies for solar energy facilities.

9.1.2.2.2 Transmission Facilities and Other Off-Site Infrastructure

An existing 115-kV transmission line intersects the southwest corner of the SEZ; this line might be available to transport the power produced in this SEZ. Establishing a connection to the existing line would not involve the construction of a new transmission line outside of the SEZ. If a connecting transmission line were constructed in a different location outside of the SEZ in the future, site developers would need to determine the impacts from construction and operation of that line. In addition, developers would need to determine the impacts of line upgrades if they were needed. Road access to the site is good, and no new roads to the site would be required. Transmission lines and roads within the SEZ would be required to support development of solar energy facilities.

The existence of large transmission lines and an existing substation to the south but in near proximity to the SEZ provides additional options for connecting solar development to the regional grid. Access to these alternative facilities would cross land managed either by the BLM or the BOR, thus no private or state lands would be affected.

9.1.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features were identified. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program would provide adequate mitigation for some identified impacts. The exceptions would be the exclusion of many existing and potential uses of the public land, perhaps in perpetuity; the visual impact of an industrialized-looking solar facility within an otherwise rural area; and any induced changes in land use on private and BOR lands.

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9.1.3 Specially Designated Areas and Lands with Wilderness Characteristics

9.1.3.1 Affected Environment

The Imperial East SEZ is located within the CDCA and the area is adjacent to several specially designated areas, including three ACECs. The SEZ is near the ISDRA and the Juan Bautista de Anza National Historic Trail (see Figure 9.1.3.1-1). The major resource values associated with the adjacent ACECs are cultural resources and wildlife habitat. There is a designated WA near the north end of the ISDRA.

As part of the planning process for the BLM-administered lands in the CDCA, all public lands, except for about 300,000 acres (1,214 km^2) of scattered parcels, were designated geographically into one of four multiple-use classes. The classification was based on the sensitivity of resources and kinds of uses for each geographic area. The multiple-use classes are (BLM 1999):

- Class C is for lands either designated as wilderness or for wilderness study areas. These lands are managed to protect their wilderness values.

- Class L (Limited Use) protects sensitive, natural, scenic, ecological, and cultural resource values. Public lands designated as Class L are managed to provide for generally lower-intensity, carefully controlled multiple use of resources, while ensuring that sensitive values are not significantly diminished.

- Class M (Moderate Use) is based upon a controlled balance between higher intensity use and protection of public lands. This class provides for a wide variety or present and future uses such as mining, livestock grazing, recreation, energy, and utility development. Class M management is also designed to conserve desert resources and to mitigate damage to those resources which permitted uses may cause.

- Class I (Intensive use). Its purpose is to provide for concentrated use of lands and resources to meet human needs. Reasonable protection will be provided for sensitive natural and cultural values. Mitigation of impacts on resources and rehabilitation of affected areas will occur insofar as possible.

Land within the Imperial East SEZ is Class L. Guidelines contained in the CDCA Plan indicate that wind, solar, or geothermal electrical generation facilities could be allowed in Class L areas.

The ISDRA is the largest mass of sand dunes in the state. Formed by windblown sands of ancient Lake Cahuilla, the dune system extends for more than 40 mi (64 km) in a band averaging 5 mi (8 km) wide. Largely known as a favorite location for off-highway vehicle (OHV) enthusiasts, the dunes also offer scenery, opportunities for solitude, and a home to rare plants and

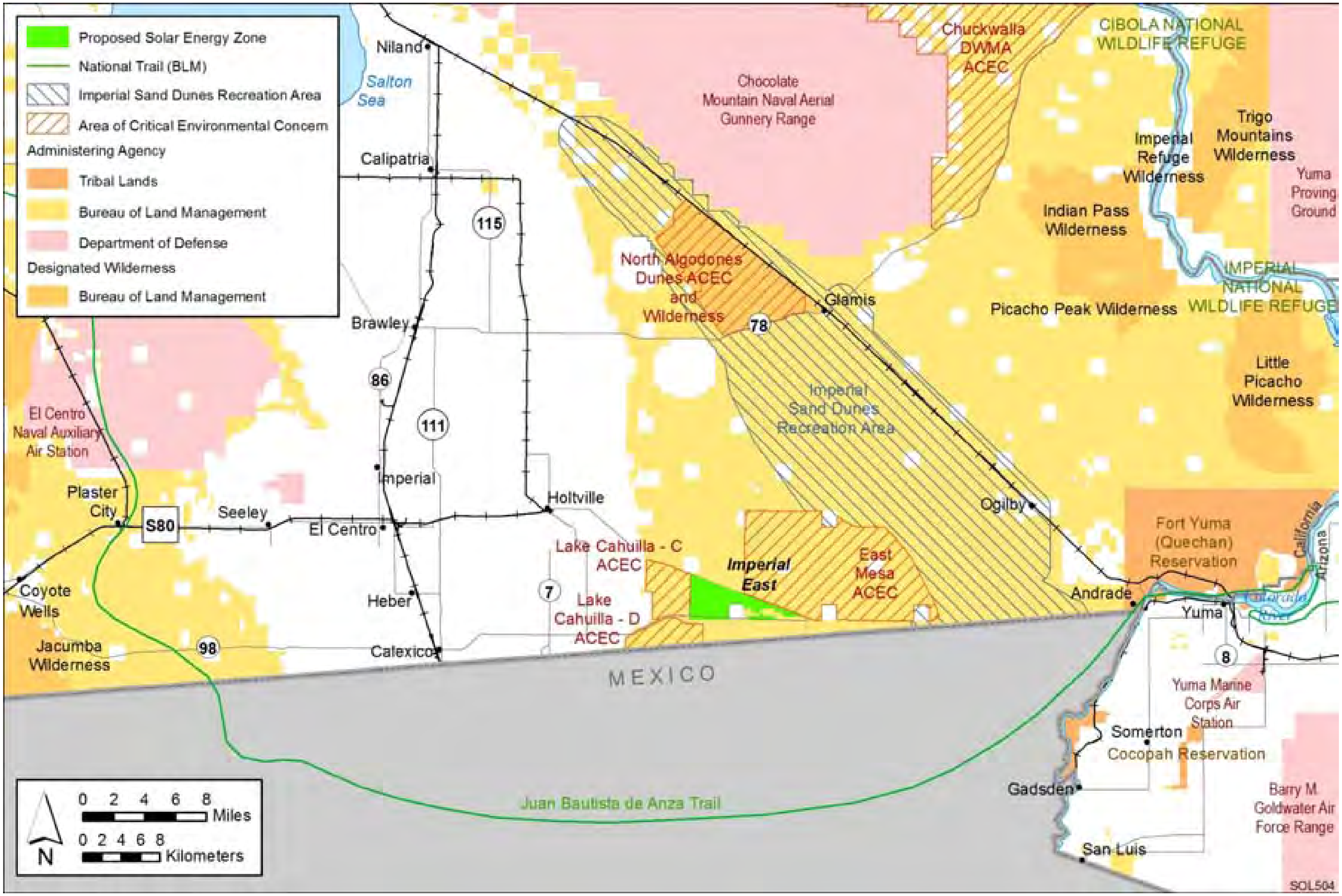

FIGURE 9.1.3.1-1 Specially Designated Areas in the Vicinity of the Proposed Imperial East SEZ

animals. The dune system consists of three areas: the northernmost area is the Mammoth Wash OHV open area and is about 22 mi (35 km) north of the SEZ; the North Algodones Dunes WA is south of Mammoth Wash and ranges from about 16 to 22 mi (26 to 35 km) from the SEZ; and the remainder of the area ranges from 10 to 22 mi (16 to 35 km) from the SEZ and stretches south from State Route 78 where the largest and most heavily used dunes are found. With some restrictions, these primary dunes may be traveled south toward the Mexican border (BLM 2010a).

There are four ACECs near the SEZ.[2] Lake Cahuilla ACECs C and D to the west of the SEZ were designated to protect prehistoric features associated with ancient Lake Cahuilla. The East Mesa ACEC, which is included within the larger East Mesa flat-tailed horned lizard Management Area, is just across I-8 from the SEZ and was designated to protect prehistoric resources and habitat of the flat-tailed horned lizard. The North Algodones Dunes ACEC, which is about 15 mi (24 km) north of the SEZ and which overlays most of the designated WA of the same name, was designated because of its outstanding scenic values.

The Juan Bautista de Anza National Historic Trail approaches to within about 17 mi (27 km) east of the SEZ, where it loops south into Mexico and then passes about 10 mi (16 km) south of the SEZ before turning north back into the United States about 20 mi (32 km) west of the SEZ. The trail then heads north and northwest. There is an auto tour route in the United States that follows much of the route of the National Historic Trail, but in the area where the trail dips south into Mexico, the route follows State Route 98, which passes through the SEZ (see Figure 9.1.3.1.1).

There are no undesignated areas with wilderness characteristics near the SEZ that have been identified.

9.1.3.2 Impacts

9.1.3.2.1 Construction and Operations

The primary potential impacts on specially designated areas generally are from visual impacts of solar energy development that could affect scenic, recreational, or wilderness characteristics of the areas. This visual impact is difficult to determine and would vary by solar technology employed, the specific area being affected, and the perception of individuals viewing the development. Assessment of the visual impact of solar energy projects must be done on a site-specific and technology-specific basis to accurately identify impacts

In general, the closer a viewer is to solar development, the greater the impact on an individual's perception. From a visual analysis perspective, the most sensitive viewing distances

[2] The ACECs included in this analysis are the ones that are either immediately adjacent to the SEZ or that were designated because of scenic resources and are within 25 mi (40 km) of the SEZ. An additional five ACECs within that distance have been determined not to be affected by development of the SEZ.

generally are from 0 to 5 mi (0 to 8 km). The viewing height above a solar energy development area, the size of the solar development area, and the purpose for which a person is visiting an area are also important. Individuals seeking a wilderness or scenic experience within these areas could be expected to be more adversely affected than those simply traveling along a highway with another destination in mind.

The occurrence of glint and glare at solar facilities could potentially cause large, but temporary, increases in brightness and visibility of the facilities. The visual contrast levels that were assumed to assess potential impacts on specially designated areas do not account for potential glint and glare effects; however, these effects would be incorporated into a future site- and project-specific assessment that would be conducted for specific proposed utility-scale solar energy projects.

The following areas could potentially be affected by development of the SEZ:

California Desert National Conservation Area

- The viewshed within 25 mi (40 km) of the Imperial East SEZ includes about 78,000 acres (316 km^2), or about 0.3% of the CDCA (see Table 9.1.14.2-1) and may be visible for over 40 mi (64 km). Installation of renewable energy facilities is consistent with the CDCA Plan. Anticipated impacts on the CDCA appear to be minimal.

Imperial Sand Dunes Recreation Area

- *The Mammoth Wash OHV Area*—This is the portion of the ISDRA most isolated from the SEZ and is 22 mi (35 km) away. The westernmost portion of the area would have long-distance views of the SEZ, but the SEZ would constitute a minor portion of the overall viewscape from the area. The majority of the OHV area would be screened from views of the SEZ. Because of the distance and the lack of visibility of the SEZ, there is no impact expected from development of the SEZ in this portion of the ISDRA.

- *North Algodones Dunes WA and ACEC*—A small portion (3%) of the WA/ACEC would have views of development within the SEZ. Because of the distance from the SEZ, the presence of agricultural development to the west in the Imperial Valley, and the motorized recreational use in the adjacent portions of the ISDRA, the potential for adverse impacts from the visual impact of the SEZ on wilderness characteristics and visitors, and on the scenic resources in the area, would not be significant.

Remainder of the ISDRA

- The largest portion of the ISDRA stretches southeast of State Route 78 for about 25 mi (40 km). The ISDRA border at its closest approach to the SEZ is about 6 mi (10 km) and solar development within the SEZ would be visible although large portions of the area would have little to no visibility of development in the SEZ. Visual impacts occurring in the ISDRA arising from solar energy development would depend on the location of the viewer and project location, project technology, site design, and other visibility factors but solar energy development within the SEZ would be expected to have a minimal impact on the ISDRA.

ACECs

- *Lake Cahuilla ACECs C and D*—The two Lake Cahuilla ACECs are located adjacent to the SEZ and could be exposed to additional human traffic related to construction and operation activities, as well as general human interest in viewing solar facilities, and this could result in the potential loss of important prehistoric resources. See Section 9.1.17 for further discussion of these areas.

- *East Mesa ACEC*—I-8 lies between the SEZ and this ACEC; thus there is no direct road connection between the two that could lead to increases in human traffic within the ACEC. It is not anticipated that solar development of the SEZ would result in any adverse effects on the prehistoric or wildlife resources in the ACEC.

Juan Bautista de Anza National Historic Trail

- The most significant portion of the National Historic Trail in the vicinity of the SEZ is about 10 mi (16 km) south in Mexico. Because the area south of the SEZ is flat, facilities in the SEZ may be visible from the trail corridor; however, the area in Mexico through which the trail corridor passes is heavily developed for agriculture, and it is anticipated that this development has a much larger effect on the trail corridor. It is anticipated there would be no impact on the Trail from solar development within the SEZ. For a discussion of the potential impact on the Juan Bautista de Anza National Historic Trail auto tour route that follows State Route 98 through the SEZ, see Section 9.1.5.2.

9.1.3.2.2 Transmission Facilities and Other Off-Site Infrastructure

See Section 9.1.2.2.2 for the discussion of the assumptions and requirements regarding construction of new transmission lines or roads that also applies to impacts on specially designated areas.

9.1.3.3 SEZ-Specific Design Features and Design Feature Effectiveness

Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program would provide adequate mitigation for some identified impacts. The exceptions would be increases in human use of the Lake Cahuilla C and D ACECs.

A proposed design feature specific to the proposed SEZ is the following:

- Because of a potential increase in human use in the two Lake Cahuilla ACECs, once solar energy facility construction begins, the BLM would monitor to determine whether increases in traffic in the ACECs occurs and whether additional management measures (e.g., fencing) are required to protect the resources in these areas.

9.1.4 Rangeland Resources

Rangeland resources include livestock grazing and wild horses and burros, both of which are managed by the BLM.

9.1.4.1 Livestock Grazing

9.1.4.1.1 Affected Environment

The SEZ is not included within a grazing allotment and grazing is not authorized.

9.1.4.1.2 Impacts

There would not be any impacts on livestock grazing.

9.1.4.1.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features would be necessary to protect or minimize impacts on livestock.

9.1.4.2 Wild Horses and Burros

9.1.4.2.1 Affected Environment

Section 4.4.2 discusses wild horses (*Equus caballus*) and burros (*E. asinus*) that occur within the six-state study area. Twenty-two wild horse and burro herd management areas (HMAs) occur within California. Also, several HMAs in Arizona are located near the Arizona–California border. Two of these HMAs (Chocolate-Mule Mountains and Cibola-Trigo) occur within a 50-mi (80-km) radius of the proposed Imperial East SEZ (Figure 9.1.4.2-1). Chocolate-Mule Mountains is the closest HMA, located nearly 22 mi (35 km) northeast of the SEZ. The Chocolate-Mule Mountains HMA contains an estimated population of 120 burros (BLM 2009b).

In addition to the HMAs managed by BLM, the U.S. Forest Service (USFS) has 51 established wild horse and burro territories in Arizona, California, Nevada, New Mexico, and Utah and is the lead management agency that administers 37 of the territories (Giffen 2009; USFS 2007). The closest territory to the proposed Imperial East SEZ is the Big Bear Territory within the San Bernardino National Forest. It is located more than 130 mi (209 km) northwest of the SEZ. This territory is managed for a population of 60 wild burros (USFS 2007).

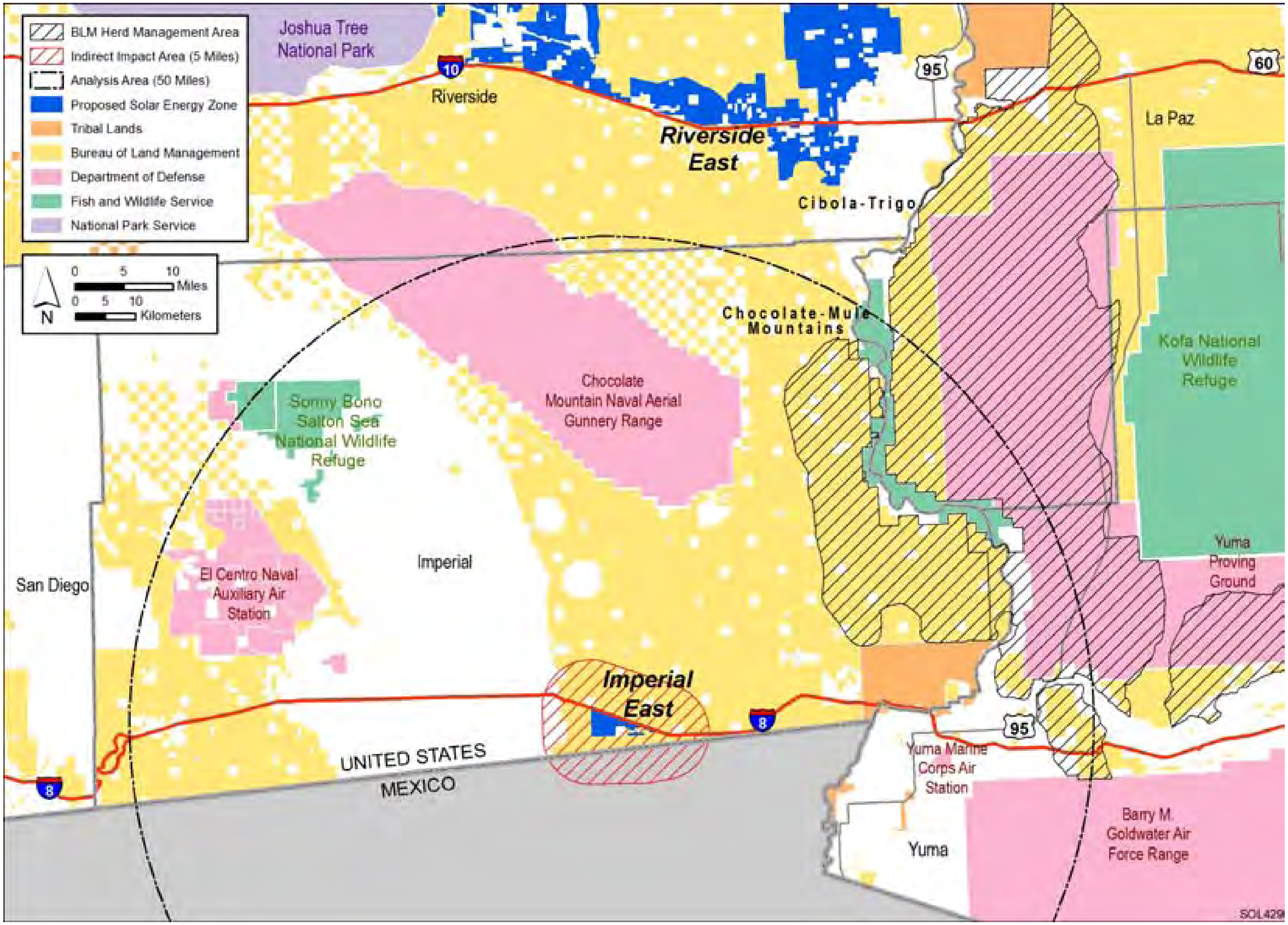

FIGURE 9.1.4.2-1 Wild Horse and Burro Herd Management Areas within the Analysis Area for the Proposed Imperial East SEZ (Source: BLM 2009a)

9.1.4.2.2 Impacts

Because the proposed Imperial East SEZ is nearly 22 mi (35 km) or more from any wild horse and burro HMA managed by the BLM and more than 130 mi (209 km) from any wild horse and burro territory administered by the USFS, solar energy development within the SEZ would not affect wild horses and burros that are managed by these agencies.

9.1.4.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A, Section A.2.2, would reduce the potential for effects on wild horses and burros. No proposed Imperial East SEZ-specific design features would be necessary to protect or minimize impacts on wild horses and burros.

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9.1.5 Recreation

9.1.5.1 Affected Environment

The proposed Imperial East SEZ area is a triangle of land located between I-8 and State Route 98. State Route 98 cuts through the very southern end of the SEZ on a slight northwesterly angle and thus leaves a small portion of the area south of the highway within the western end of the SEZ. The western boundary of the SEZ is bordered by two double wood pole transmission lines, and the view to the south is dominated by additional transmission lines and the All-American Canal and associated facilities. The area is very flat and sparsely vegetated, mainly with creosotebush. The recreation value of the area is very low. Although there are signs of vehicle tracks throughout the area, it is not open to vehicle travel, but there are short segments of roads in the area that are designated as open to travel (BLM 2007b). The small Tamarisk Long Term Visitor Area (LTVA, about 10 units) is located just outside the SEZ and south of State Route 98. In the last two years, the LTVA has had no more than three or four camper units present at a time in the period from October through March (Meeks 2010). Visitors staying at the LTVA are likely the most frequent users of the SEZ area since it is within easy walking distance. Walking and bird watching are the most likely recreation uses of the area (Meeks 2010). Some people may be attracted to the area by the presence of two cultural resource ACECs on the west end of the SEZ, the All-American Canal, the international boundary fence about 1 mi (1.6 km) south of the area, and the Juan Bautista de Anza National Historic Trail auto tour route, which follows State Route 98.

There are few OHV routes designated as open within the proposed Imperial East SEZ; these are discussed in Section 9.1.21 and shown in Figure 9.1.21-1.

9.1.5.2 Impacts

Recreational users would be excluded from developed areas of the SEZ. Although there are no recreational use figures for the area of the SEZ, because of the generally low-quality recreation opportunities in the SEZ, the impact of solar energy development in the SEZ on recreation use is expected to be minimal.

The actual location of the route of the Juan Bautista de Anza Trail is about 10 mi (16 km) south in Mexico, but visitors traveling the auto route of the trail on State Route 98 may find the presence of a large solar development along the route inconsistent with their reasons for traveling the route. The potential effect of this on tour route travelers is not known. Because the SEZ is not actually on the route of the trail and because the area nearby already has been altered by the presence of the All-American Canal and related facilities, numerous transmission lines, and the international boundary fence, it is not anticipated that there would be a loss of recreation use of the auto tour route as a result of development of the SEZ.

Open OHV routes crossing areas granted ROWs for solar facilities would be re-designated as closed. However, a programmatic design feature addressing recreational impacts would require consideration of development of alternative routes that would retain a similar level of access across and to public lands as a part of the project proposal (see Section 5.5.1 for more details on how routes coinciding with proposed solar facilities would be treated).

9.1.5.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features were identified for addressing impacts on recreation use at the proposed Imperial East SEZ. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program would provide adequate mitigation for any recreational use impacts. The exceptions would be in the loss of any recreational use in the SEZ which would not be mitigated.

9.1.6 Military and Civilian Aviation

9.1.6.1 Affected Environment

The SEZ is entirely covered by two military training routes (MTRs) and Special Use Airspace (SUA). The area is identified in BLM land records (BLM and USFS 2010b) as requiring consultation with the U.S. Department of Defense (DoD) prior to approval of any facilities.

Four small public airports are within approximately 34 mi (55 km) of the Imperial East SEZ—three in the United States and one in Mexicali, Mexico. The Mexicali airport is the closest of the four airports and is about 5 mi (8 km) southwest of the SEZ.

9.1.6.2 Impacts

The development of any solar energy or transmission facilities that encroach into the airspace of the MTR/SUA could interfere with military training activities. While the military has indicated that solar development on portions of the Imperial East SEZ is compatible with existing military use, it has also commented that other portions should have height limits for facilities, and some areas may be incompatible with existing military use. The system of military airspace in the Southwest overlaps much of the area of highest interest for solar development and there is potential for solar development to result in cumulative effects on the system of MTRs that stretch beyond just one SEZ.

It is assumed that airspace required for the Mexicali airport is completely contained in Mexico, so there normally would be no effect from facilities constructed in the SEZ; however, inclement weather conditions or other considerations could alter this situation. The U.S. airports are all far enough away not to be affected by solar facilities in the SEZ.

9.1.6.3 SEZ-Specific Design Features and Design Feature Effectiveness

Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program would provide adequate mitigation for some identified impacts on military and civilian aviation. The exception would be the potential impacts on the operation of Mexicali Airport if solar power towers are utilized within the SEZ.

A proposed design feature specific to the proposed SEZ is the following:

- Should power tower facilities be proposed for the SEZ, coordination across the international border should be required to ensure that there is no airspace management concern associated with the Mexicali Airport.

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9.1.7 Geologic Setting and Soil Resources

9.1.7.1 Affected Environment

9.1.7.1.1 Geologic Setting

Regional Geology

The proposed Imperial East SEZ is located in the Imperial Valley, part of the Salton Trough, a sediment-filled structural basin that lies within the Basin and Range physiographic province in southern California (Figure 9.1.7.1-1). The Salton Trough is the landward extension of the East Pacific Rise as it emerges from the 1,000-mi (1,609-km) long trough occupied by the Gulf of California and continues northward to Palm Springs. The East Pacific Rise is a crustal spreading center characterized by a series of northwest-trending transform (strike-slip) faults, the northernmost being the San Andreas Fault System. The tectonic activity of the East Pacific Rise has downwarped, downfaulted, extended, and laterally translated the sediments within the Salton Trough. Although the basin is geologically complex, its surface is relatively featureless (Riney et al. 1982; Mase et al. 1981; Morton 1977).

The Salton Trough has received a continuous influx of sand, silt, and clay derived from the Colorado River, which created ephemeral lakes in the basin until about 300 years ago. Underlying this alluvial cover is a succession of late Tertiary and Quaternary sediments composed mainly of marine and nonmarine sandstones and clays and lake deposits. Water-bearing aquifers occur in the upper 2,000 ft (610 m) of these deposits (Loeltz et al. 1975). The depth to basement rock ranges from 11,000 to 15,400 ft (3,353 to 4,694 m), though metamorphism of sedimentary deposits is known to occur at depths as shallow as 4,000 ft (1,219 m) because of the high heat flows associated with crustal spreading. High heat flows also give rise to geothermal steam; and several known geothermal resource areas occur throughout the valley (Riney et al. 1982; Mase et al. 1981; Morton 1977; Robinson et al. 1976) Exposed sediments near the Imperial East SEZ consist mainly of modern alluvium, lake, and playa deposits (Q) and dune sands (Qs) (Figure 9.1.7.1-2).

Topography

The Imperial Valley is a flat, alluvium-filled basin following the same northwest trend as the Salton Trough. Located in the south-central part of Imperial County, the valley lies at or below sea level and has an area of about 989,450 acres (4,004 km^2) in the United States. It is bounded to the north by the Salton Sea and extends south into Mexico. To the east are the Algodones Dunes and Sand Hills; to the west (from north to south) are the Fish Creek Mountains, Superstition Hills, Superstition Mountain, and the Coyote Mountains. The Yuha Desert lies to the southwest. The Imperial Valley is separated from the Gulf of California by the ridge of the Colorado River delta (in Mexico), which has an elevation of about 30 ft (9 m) above mean sea level (MSL) at its lowest point (Morton 1977; Zimmerman 1981).

FIGURE 9.1.7.1-1 Physiographic Features in the Imperial Valley Region

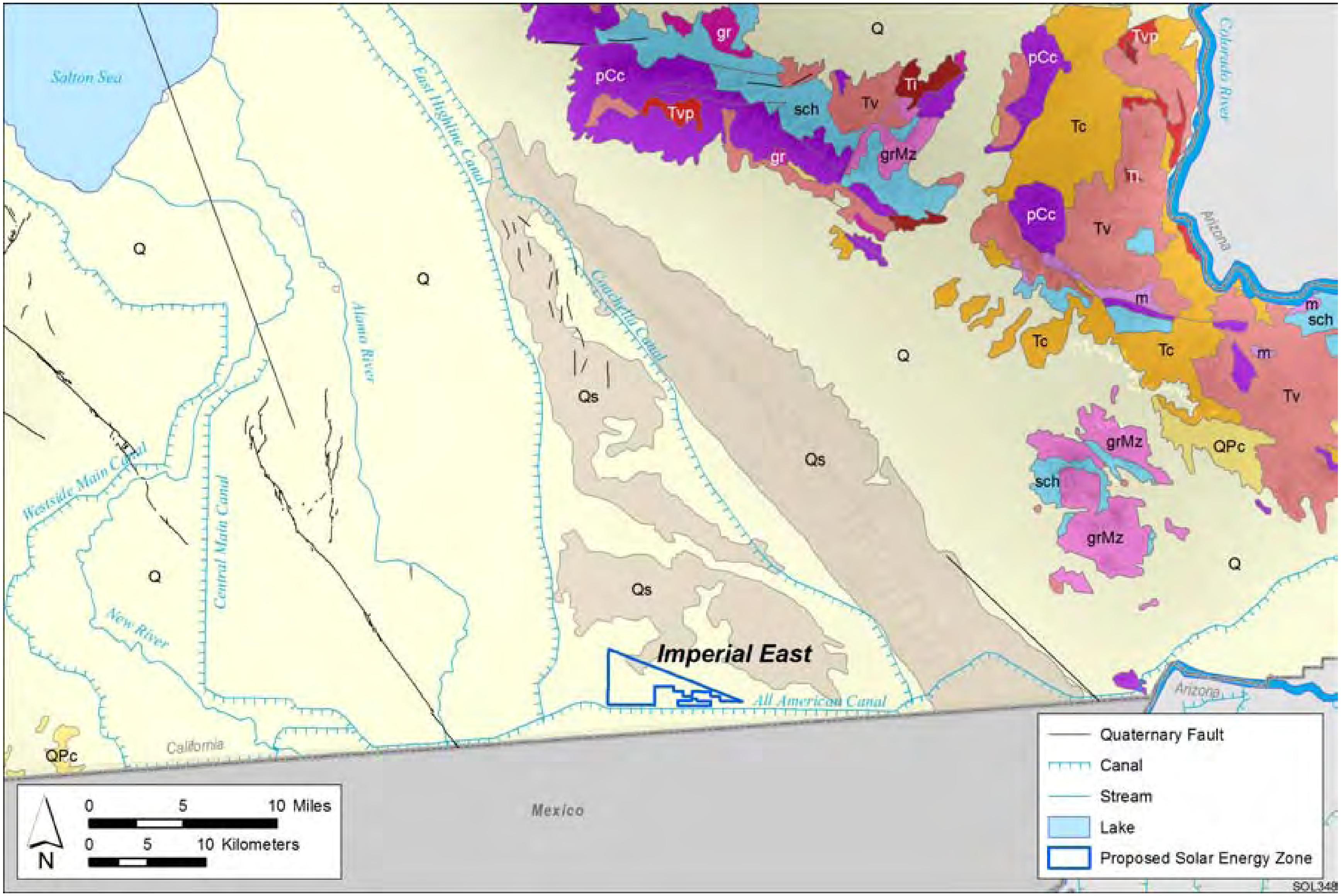

FIGURE 9.1.7.1-2 Geologic Map of the Imperial Valley Region (adapted from Ludington et al. 2007 and Gutierrez et al. 2010)

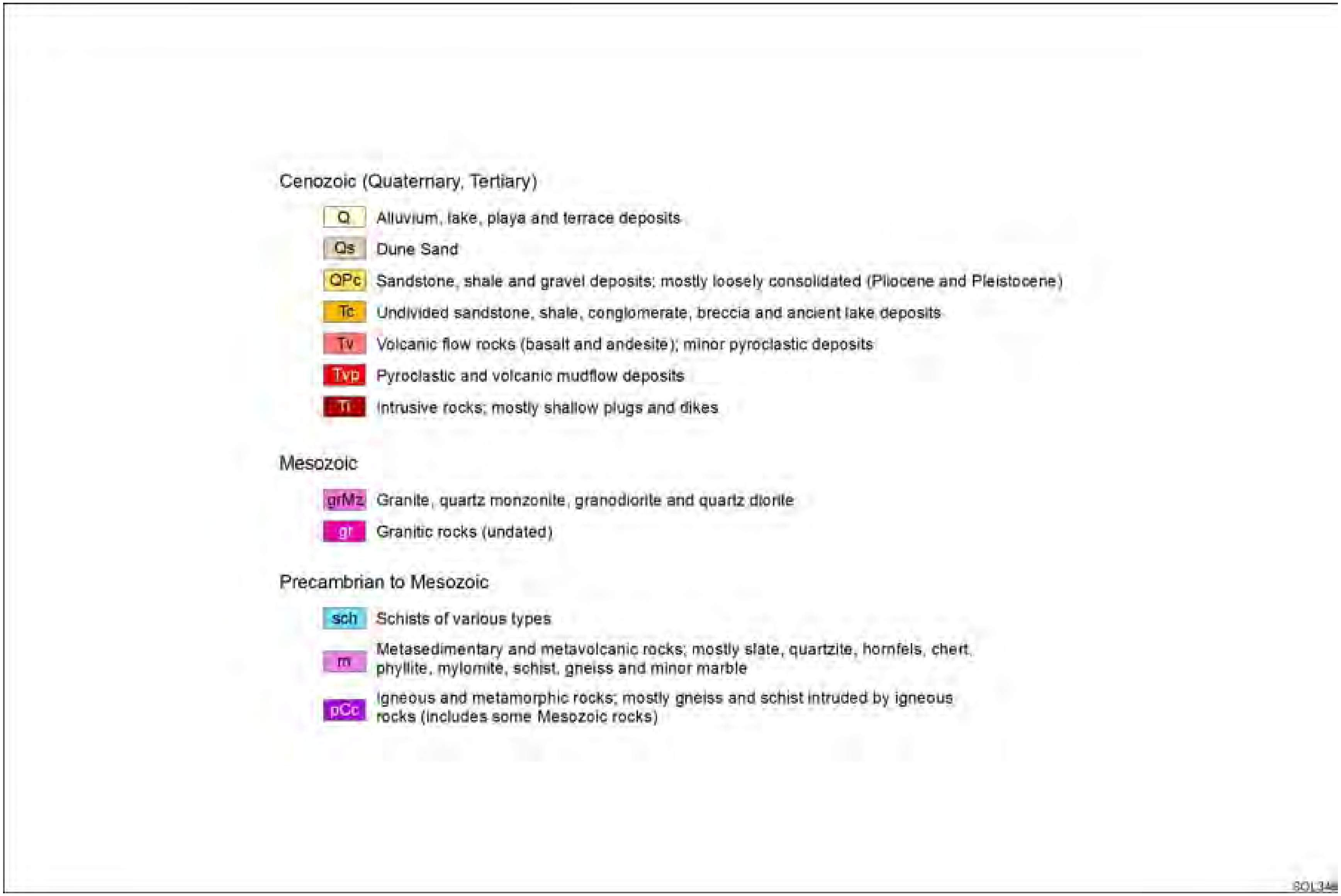

FIGURE 9.1.7.1-2 (Cont.)

As recently as 300 years ago, a freshwater lake, called Lake Cahuilla, filled the Imperial Valley basin to the elevation of the Colorado River delta. The ancient lake was actually a succession of lakes that periodically overflowed and covered a major portion of the Salton Trough during the late Pleistocene and Holocene epochs. Muds and silts of this ancient lake form the top 197 to 328 ft (60 to 100 m) of strata within the Imperial Valley (Mase et al. 1981). The former shoreline marking the maximum Holocene water level of Lake Cahuilla is well preserved around the margins of the Imperial Valley at an elevation of about 40 to 48 ft (12 to 15 m) above sea level (Blake 1914; Stanley 1963). At this maximum level, Lake Cahuilla would have been over 300 ft (91 m) deep, 105 mi (170 km) long, and 35 mi (56 km) across at its widest point (Hubbs and Miller 1948; Waters 1983). The Salton Trough is currently occupied by the Salton Sea, which lies 200 ft (61 m) below sea level (Riney et al. 1982).

The proposed Imperial East SEZ is located between the east side of the Lake Cahuilla lakebed and the Algodones Sand Hills on a desert plain, called the Imperial East Mesa, a terrace of the Colorado River delta. Its terrain is relatively flat with a very gentle dip to the west (Figure 9.1.7.1-3). Elevations range from about 40 ft (12 m) near the southeastern corner of the site to less than 20 ft (6.1 m) along its western boundary. The All-American Canal is located south of the site and runs parallel to its southern border.

Geologic Hazards

The types of geologic hazards that could potentially affect solar project sites and their mitigation are discussed in Sections 5.7.3 and 5.7.4. The following sections provide a preliminary assessment of these hazards at the proposed Imperial East SEZ. Solar project developers may need to conduct a geotechnical investigation to assess geologic hazards locally to better identify facility design criteria and site-specific design features to minimize their risk.

Seismicity. The proposed Imperial East SEZ is located east of the San Andreas Fault Zone, a seismically active region dominated by northwest-trending right-lateral strike slip faulting that is categorized as “potentially active” (i.e., having surface displacement within the last 11,000 years [Holocene]) under the Alquist-Priolo Earthquake Fault Zoning Act (Figure 9.1.7.1-4). The term “potentially active” generally denotes that a fault has shown evidence of surface displacement during Quaternary time (the last 1.6 million years). However, because there are numerous such faults in California, the State Geologist has introduced new, more discriminating criteria for zoning faults under the Alquist-Priolo Act. Currently, zoned faults include those that are “sufficiently active,” showing evidence of surface displacement within the past 11,000 years along one or more of its segments or branches, and “well-defined,” having a clearly detectable trace at or just below the ground surface (Bryant and Hart 2007).

Although the Imperial Valley is a seismically active area (with over 2,000 recorded earthquakes in the past 10 years), no known Quaternary faults intersect the proposed Imperial East SEZ (Figure 9.1.7.1-4). Earthquake activity over the past 100 years has consisted predominantly of swarms and clustered events along the Brawley Fault Zone, interspersed with swarms and magnitude 5 to 7 main-shock/aftershock sequences along the Imperial Fault just to

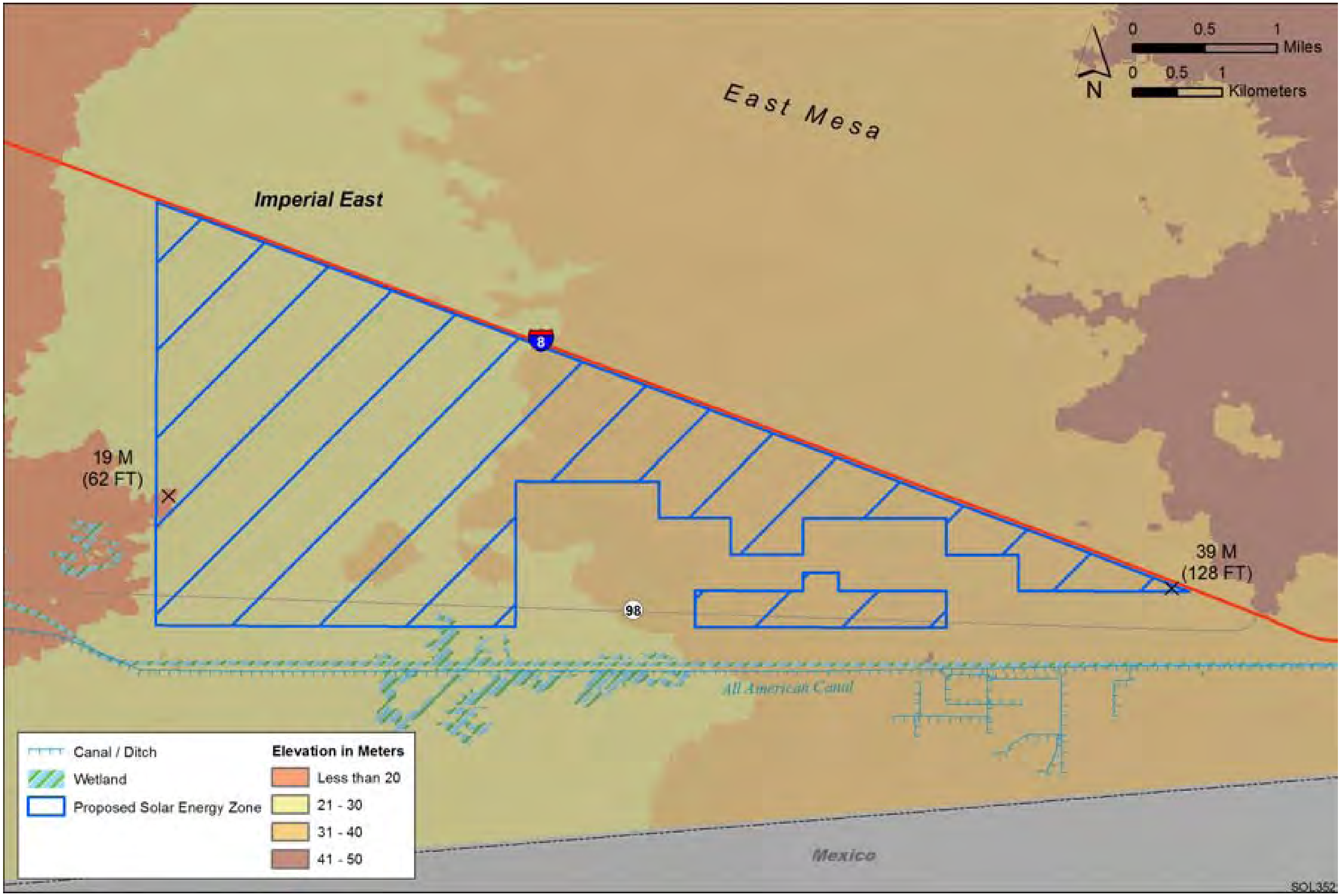

FIGURE 9.1.7.1-3 General Terrain of the Proposed Imperial East SEZ

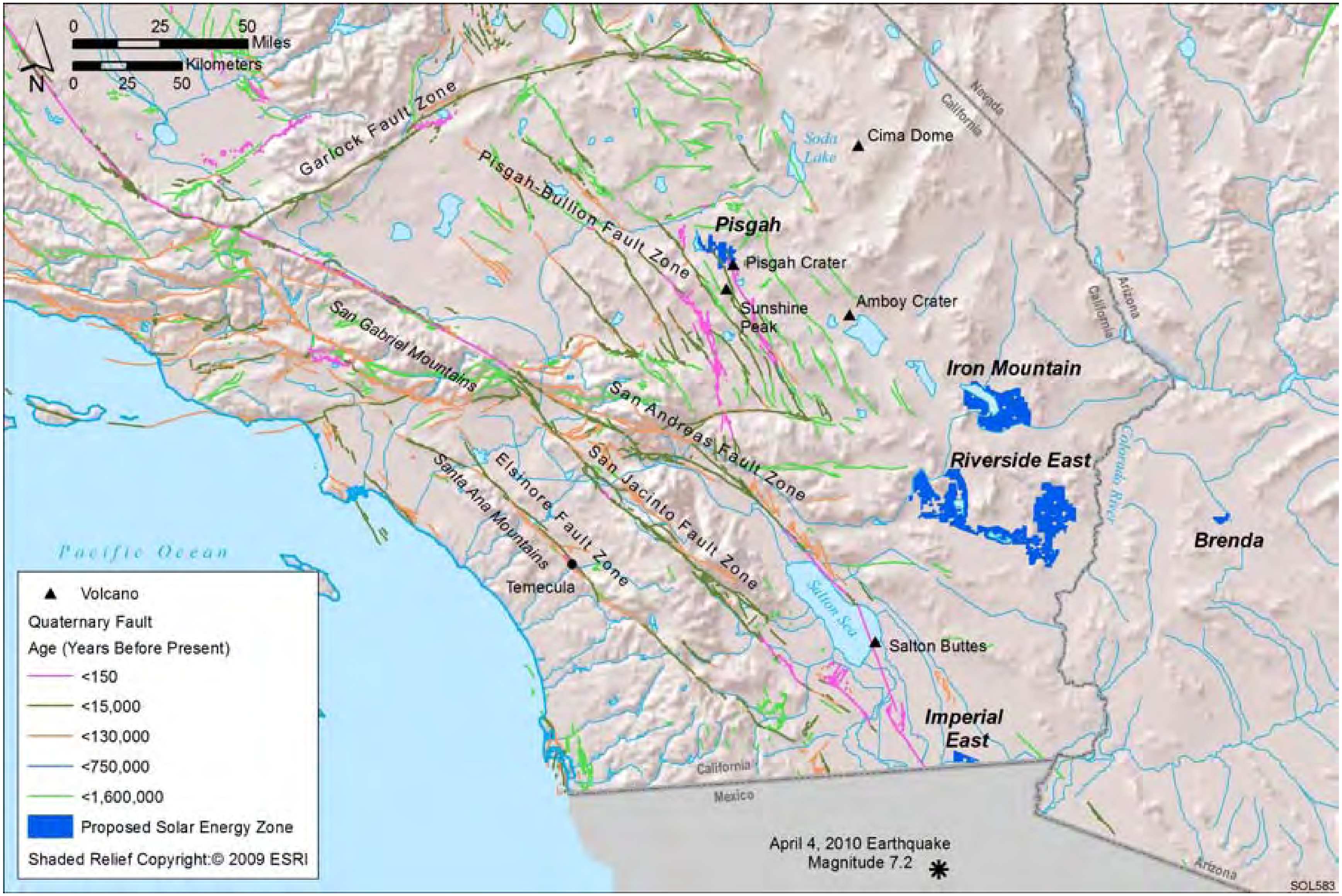

FIGURE 9.1.7.1-4 Quaternary Faults and Volcanoes in Southern California (USGS and CGS 2009; USGS 2010d)

the west of the site (Figure 9.1.7.1-5). Focal depths of earthquakes in the Imperial Valley are generally between 3 and 4 mi (4 and 6 km), with a maximum depth of about 5 mi (8 km) (Johnson and Hill 1982).

The Imperial Fault is the main strand of the San Andreas Fault System in the southern Salton Trough (Figure 9.1.7.1-5). The fault accommodates slip from both the San Andreas and San Jacinto Fault Zones. These fault zones are seismically active regions dominated by northwest-trending right-lateral strike slip faulting and are categorized as “potentially active” (i.e., having surface displacement within the last 11,000 years [Holocene]) under the Alquist-Priolo Earthquake Fault Zoning Act. The term “potentially active” generally denotes that a fault has shown evidence of surface displacement during Quaternary time (the last 2.6 million years). However, because there are numerous such faults in California, the State Geologist has introduced new, more discriminating criteria for zoning faults under the Alquist-Priolo Act. Currently, zoned faults include those that are “sufficiently active,” showing evidence of surface displacement within the past 11,000 years along one or more of its segments or branches, and “well-defined,” having a clearly detectable trace at or just below the ground surface (Bryant and Hart 2007).

Two major earthquakes have occurred along the Imperial fault, causing significant surface rupture: the 1940 and 1979 Imperial Valley earthquakes (magnitudes 6.9 and 6.4, respectively). Based on these recent events, late Holocene creep rates have been estimated to range from 15 to 20 mm/yr. Slip along the Imperial Fault is transferred north to the San Andreas Fault Zone through the Brawley Seismic Zone (Figure 9.1.7.1-5). Locally, there is a vertical component (via subsidence) to the offset near Mesquite Lake to the northeast of the Imperial Fault and west of the Brawley Seismic Zone. Average recurrence intervals are estimated to range from 40 to 137 years (Treiman 1999).

On April 4, 2010, an earthquake referred to as the El Mayor-Cucapah Earthquake, registering a moment magnitude (Mw[3]) of 7.2 (at an approximate depth of 6.2 mi [10 km]), occurred along a segment of the Laguna Salada fault system in northern Baja California, about 30 mi (50 km) southwest of the Imperial East SEZ (Figure 9.1.7.1-4). The Laguna-Salada system is a northwest-trending zone of strike-slip faults that runs parallel to the San Andreas fault system. Displacement was a combination of vertical (east side down) and right lateral shifts with cumulative lateral offsets of about 3.9 ft (1.2 m). Aftershocks were concentrated along a northwest-trending line extending from the Colorado River delta (on the Gulf of California, Mexico) to Temecula, California. Ground-shaking in the vicinity of the Imperial East SEZ is estimated to have been very strong (about 0.18 to 0.34 g) with moderate to heavy potential structure damage (SCSN 2010 and USGS 2010d).

[3] Moment magnitude (Mw) is used for earthquakes with magnitudes greater than 3.5 and is based on the moment of the earthquake, equal to the rigidity of the earth times the average amount of slip on the fault times the amount of fault area that slipped (USGS 2010e).

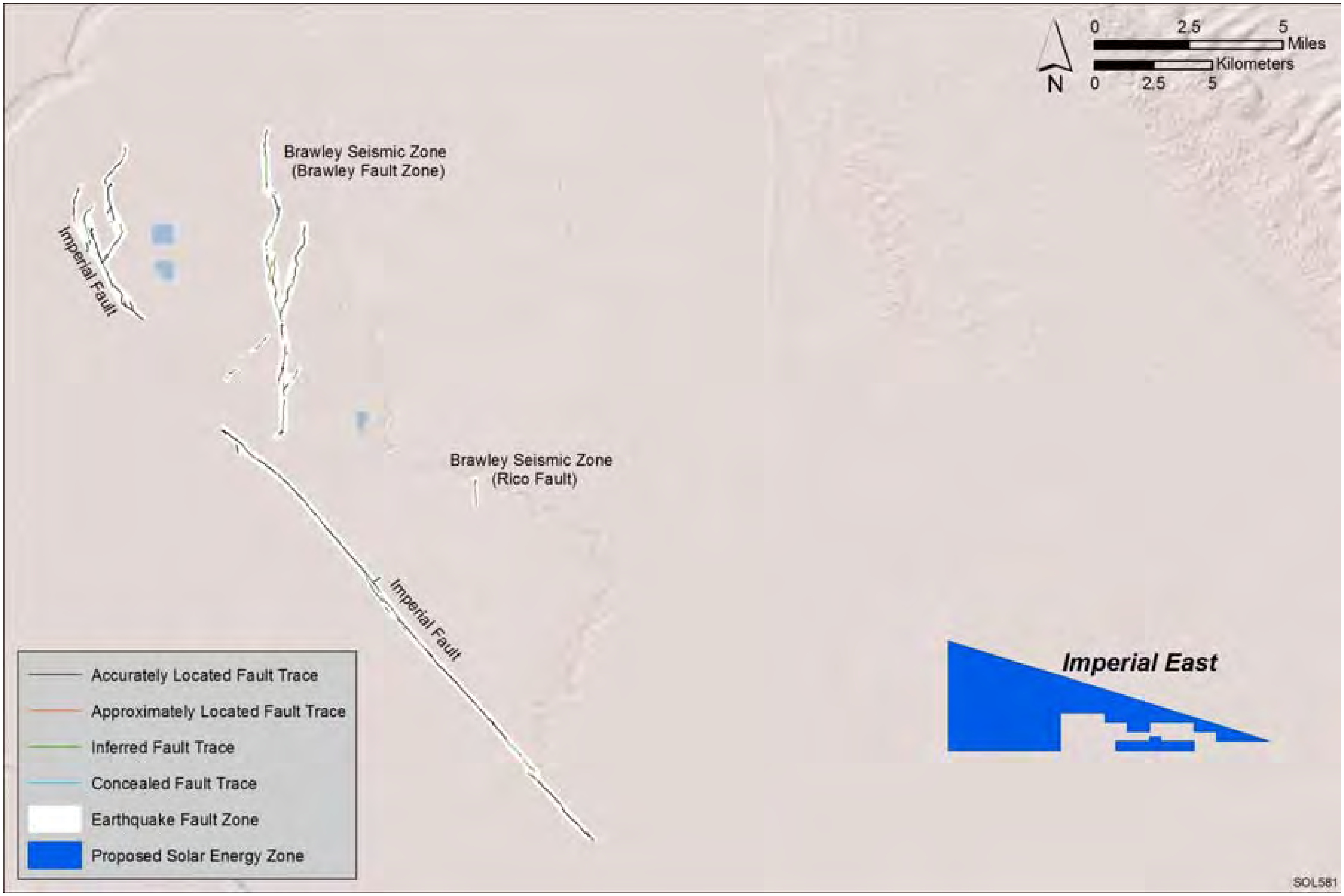

FIGURE 9.1.7.1-5 Delineated Earthquake Fault Zones near the Proposed Imperial East SEZ (CGS 2010)

Liquefaction. The proposed Imperial East SEZ lies within an area where the peak horizontal acceleration with a 10% probability of exceedance in 50 years is between 0.30 and 0.60 g. Shaking associated with this level of acceleration is generally perceived as very strong to severe; the potential damage to structures is moderate to heavy (USGS 2008).

The 1979 Imperial Valley earthquake caused right lateral movement along a 22-mi (35-km) section of the Imperial Fault. Evidence of liquefaction as a result of this earthquake has been observed at several locations within the Imperial Valley, especially within the fine-grained fluvial sediments (point bar, channel fill, and overbank deposits associated with the Alamo River) and interbedded channel sands and lacustrine clays on the East Mesa. Sediments most affected were those in the upper 16 ft (5 m); below this depth, sand deposits were found to be dense enough to resist liquefaction under the ground-shaking conditions generated by the 1979 earthquake. The types of sediments with the greatest liquefaction effects were loose to very loose silt to clayey silt (overbank deposits), very loose to medium dense very fine sand to silt (channel fill), and stiff to very stiff silty clay to clay (lacustrine deposits). Investigators identified liquefaction effects such as sand boils, ground cracks, earth slumps, earth falls, rock falls, rock slides, lateral spreading, and ground settlement, some within 10 mi (16 km) of the SEZ (Bennet et al. 1981, 1984; Youd and Wieczorek 1982). On the basis of these findings, as well as the similarity in surface material and the very strong to severe ground-shaking intensity that is probable in the region during an earthquake, the risk of liquefaction and ground failure (i.e., permanent ground displacement capable of damaging structures) at the proposed Imperial East SEZ is considered high.

Volcanic Hazards. The nearest volcanoes to the proposed Imperial East SEZ are the five small rhyolitic domes (Obsidian Butte, Rock Hill, Red Island [composed of two domes], and Mullet Island) forming the Salton Buttes along the southeast end of the Salton Sea, about 40 mi (65 km) north-northwest of the SEZ (Figure 9.1.7.1-4). The Salton Buttes are within the Salton Sea Geothermal Field and are part of the active crustal spreading center that lies beneath the Colorado River delta sediments. The domes exhibit a bimodal (basalt-rhyolite) composition and were most recently active about 16,000 years ago. The most likely future potential hazard associated with the Salton Buttes volcanoes would result from an explosive rhyolitic eruption, which could give rise to pyroclastic flows and surges; these events could be destructive to distances of 6 mi (10 km) from an active vent (Robinson et al. 1976; Miller 1989).

The nearest active volcano is Mount St. Helens in the Cascade Range (Washington), about 1,000 mi (1,590 km) north-northwest of Imperial Valley; it has shown some activity as recently as 2008. The nearest volcano that meets the criterion for an unrest episode is the Long Valley Caldera in east-central California, about 400 mi (640 km) to the northwest, which has experienced recurrent earthquake swarms, changes in thermal springs and gas emissions, and uplift since 1980 (Diefenbach et al. 2009). The Long Valley Caldera is part of the Mono-Inyo Craters volcanic chain that extends from Mammoth Mountain (on the caldera rim) northward about 25 mi (40 km) to Mono Lake. Small to moderate eruptions have occurred at various sites along the volcanic chain in the past 5,000 years at intervals ranging from 250 to 700 years. Wind-blown ash from some of these eruptions is known to have drifted as far east as Nebraska. While the probability of an eruption within the volcanic chain in any given year is small (less than 1%), serious hazards could result from a future eruption. Depending on the location, size, timing (season), and type of eruption, hazards could include mudflows and flooding, pyroclastic flows, small to moderate volumes of tephra, and falling ash (Hill et al. 1998, 2000; Miller 1989).

Earthquake swarms also occurred at Medicine Lake Volcano in northern California (Cascade Range) for a few months in 1988. Medicine Lake is located about 700 mi (1,130 km) northwest of the SEZ (Diefenbach et al. 2009). The most recent eruption at Medicine Lake was rhyolitic in composition and occurred about 900 years ago (USGS 2010f). Nearby Lassen Peak last erupted between 1914 and 1917; at least two blasts during this period produced mudflows that inundated the valley floors of Hut and Lost Creeks to the east. Tephra from the most violent eruption, occurring on May 22, 1915, was carried by prevailing winds and deposited as far as 310 mi (500 km) to the east (Miller 1989).

Slope Stability and Land Subsidence. The incidence of rock falls and slope failures in the vicinity of the proposed Imperial East SEZ is low because it is located on the relatively flat terrain of the Imperial East Mesa.

Subsidence due to earthquakes, geothermal fluid production, and groundwater withdrawal has been observed in the Imperial Valley. The Imperial County Department of Public Works[4] established a subsidence monitoring program (Geothermal Subsidence Detection Network) between 1971 and 1972. Monitoring has shown that substantial downward movement of the valley floor relative to the mountains to the west has occurred (Crow and Kasamayer 1978). A study conducted by Massonnet et al. (1997) found maximum rates of subsidence on the East Mesa to be about 18 mm/yr between 1991 and 1994. Subsidence is not generally a serious hazard if it occurs as a broad depression over a large region (except in flood-prone areas sensitive to changes in elevation). The major problems associated with subsidence occur as a result of differential vertical subsidence, horizontal displacement, and earth fissures (Burbey 2002).

Other Hazards. Other potential hazards at the Imperial East SEZ include those associated with soil compaction (restricted infiltration and increased runoff), expanding clay soils (destabilization of structures), and hydro-compactable or collapsible soil (settlement). Disturbance of soil crusts and desert varnish on soil surfaces may also increase the likelihood of soil erosion by wind. Section 9.1.9.1.1 provides a discussion of flood risks within the Imperial East SEZ.

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[4] The Imperial County Department of Public Works together with the Imperial Irrigation District, the California Division of Oil and Gas, and the U.S. Geological Survey formed the Imperial Valley Subsidence Detection Committee in the 1970s and constructed a network of precisely leveled benchmarks throughout the valley (Crow and Kasameyer 1978).

9.1.7.1.2 Soil Resources

Soils within the proposed Imperial East SEZ are predominantly fine sands and loamy fine sands of the Rositas and Superstition Series, which together make up about 96% of the soil coverage at the site (Figure 9.1.7.1-6). Soil map units within the Imperial East SEZ are described in Table 9.1.7.1-1. Parent material consists of alluvium and eolian sands derived from various sources. Soils are characterized as moderately to somewhat excessively well drained. Most soils on the site have low surface runoff potential and rapid permeability. The natural soil surface is suitable for roads, with a slight to moderate erosion hazard when used as roads or trails. The water erosion potential is slight for all soils. The susceptibility to wind erosion is high for most soils, with as much as 220 tons of soil eroded by wind per acre each year. All the soils within the SEZ have features that are favorable for fugitive dust formation (NRCS 2010). Biological soil crusts and desert pavement have not been documented in the SEZ, but may be present.

None of the soils within the SEZ is rated as hydric[5] (a few units have not been rated). Flooding is not likely for soils at the site (occurring less than once in 500 years). Most of the soils (about 91%) are classified as farmland of statewide importance; about 6% of the soils (Superstition loamy fine sand) are classified as prime farmland if irrigated (NRCS 2010).

9.1.7.2 Impacts

Impacts on soil resources would occur mainly as a result of ground-disturbing activities (e.g., grading, excavating, and drilling), especially during the construction phase of a solar project. These include soil compaction, soil horizon mixing, soil erosion and deposition by wind, soil erosion by water and surface runoff, sedimentation, and soil contamination. Such impacts are common to all utility-scale solar energy developments in varying degrees and are described in more detail for the four phases of development in Section 5.7.1.

Because impacts on soil resources result from ground-disturbing activities in the project area, soil impacts would be roughly proportional to the size of a given solar facility, with larger areas of disturbed soil having a greater potential for impacts than smaller areas (Section 5.7.2). The magnitude of impacts would also depend on the types of components built for a given facility since some components would involve greater disturbance and would take place over a longer timeframe.

9.1.7.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features were identified for soil resources at the proposed Imperial East SEZ. Implementing the programmatic design features described in Appendix A, Section A.2.2., as required under BLM’s Solar Energy Program, would reduce the potential for soil impacts during all project phases.

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[5] A hydric soil is a soil formed under conditions of saturation, flooding, or ponding.

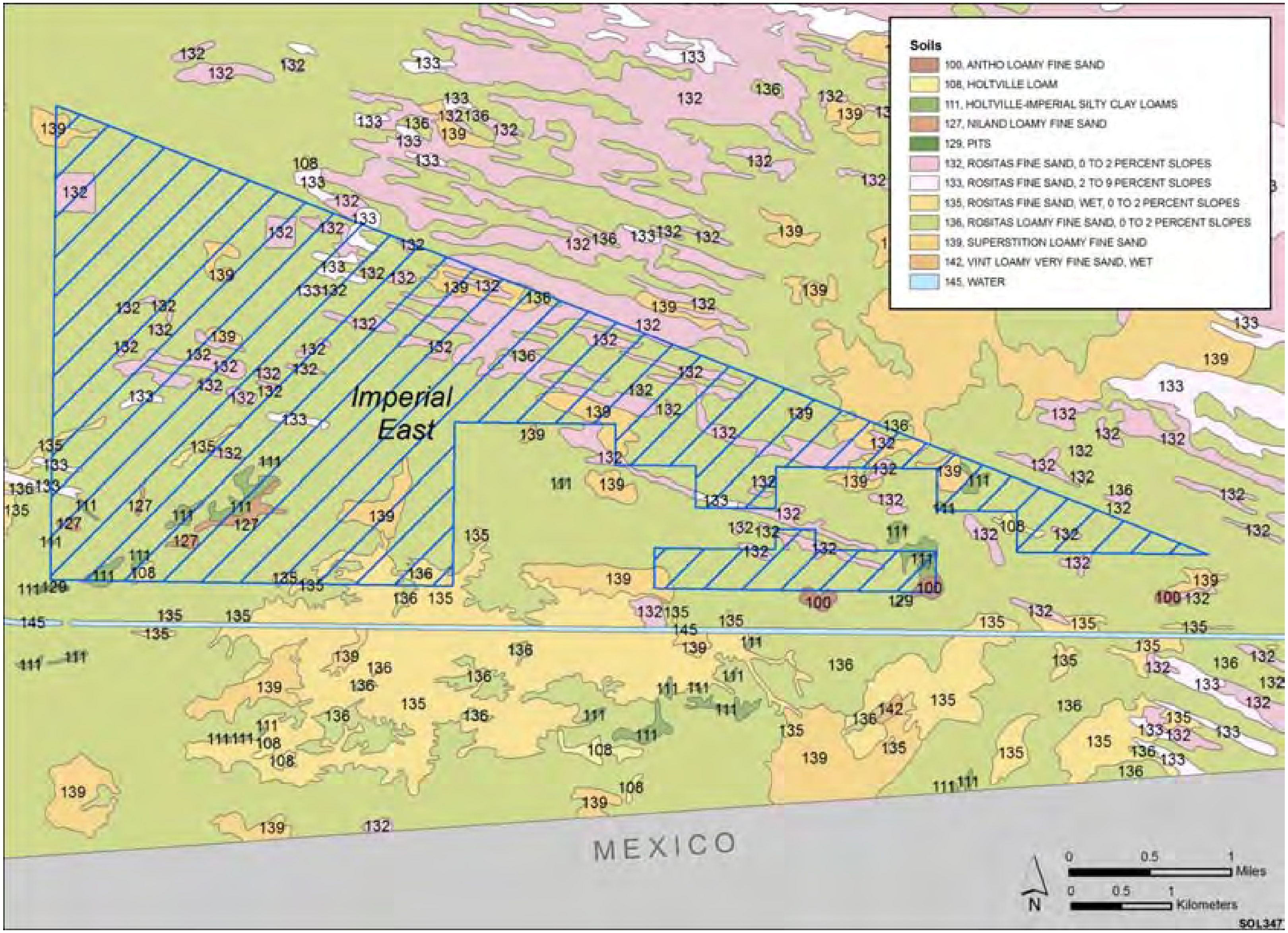

FIGURE 9.1.7.1-6 Soil Map for the Proposed Imperial East SEZ (NRCS 2008)

TABLE 9.1.7.1-1 Summary of Soil Map Units within the Proposed Imperial East SEZ

Map Unit Symbol	Map Unit Name	Water Erosion Potential[a]	Wind Erosion Potential	Description	Area in Acres[b] (% of SEZ)
136	Rositas loamy fine sand (0 to 2% slope)	Slight (0.10)	High (WEG 2)[c]	Nearly level soils on the valley floor. Parent material consists of alluvium and eolian deposits derived from mixed sources. Very deep and somewhat excessively drained with low surface runoff potential (high infiltration rate) and rapid permeability; slightly saline. Available water capacity is low. Moderate rutting hazard. Used mainly for grazing, cropland, and wildlife habitat. Crops include citrus fruits, grapes, alfalfa, and truck crops. Farmland of statewide importance.[d]	8,515 (67)
135	Rositas fine sand, wet (0 to 2% slopes)	Slight (0.05)	High (WEG 1)	Nearly level soils on the valley floor. Parent material consists of alluvium and eolian deposits derived from mixed sources. Very deep and moderately well drained with low surface runoff potential (high infiltration rate) and rapid permeability; nonsaline to very slightly saline. Available water capacity is low. Moderate rutting hazard. Used mainly for grazing, cropland, and wildlife habitat. Crops include citrus fruits, grapes, alfalfa, and truck crops. Farmland of statewide importance.	1,904 (15)
132	Rositas fine sand (0 to 2% slopes)	Slight (0.05)	High (WEG 1)	Nearly level soils on the valley floor. Parent material consists of alluvium and eolian deposits derived from mixed sources. Very deep and somewhat excessively drained with low surface runoff potential (high infiltration rate) and rapid permeability; nonsaline to very slightly saline. Available water capacity is low. Moderate rutting hazard. Used mainly for grazing, cropland, and wildlife habitat. Crops include citrus fruits, grapes, alfalfa, and truck crops. Farmland of statewide importance.	854 (7)
139	Superstition loamy fine sand	Slight (0.10)	High (WEG 2)	Nearly level to gently sloping soils on alluvial fans. Parent material consists of alluvium derived from mixed sources. Very deep and somewhat excessively drained with low surface runoff potential (high infiltration rate) and rapid permeability; nonsaline. Most areas are without vegetation; provides some cover for wildlife. Available water capacity is low. Moderate rutting hazard. Used mainly for grazing and irrigated cropland. Prime farmland if irrigated.	756 (6)

TABLE 9.1.7.1-1 (Cont.)

Map Unit Symbol	Map Unit Name	Water Erosion Potential[a]	Wind Erosion Potential	Description	Area in Acres[b] (% of SEZ)
133	Rositas fine sand (0 to 9% slopes)	Slight (0.05)	High (WEG 1)	Nearly level to gently sloping soils on alluvial fans and sand sheets. Parent material consists of eolian deposits derived from mixed sources. Very deep and somewhat excessively drained, with low surface runoff potential (high infiltration rate) and rapid permeability; nonsaline to very slightly saline. Available water capacity is low. Moderate rutting hazard. Used mainly for grazing, cropland, and as wildlife habitat. Crops include citrus fruits, grapes, alfalfa, and truck crops. Farmland of statewide importance.	163 (1)
111	Holtville Imperial silty clay loam	Moderate (0.32)	Moderate (WEG 4)	Consists of about 50% Holtville silty clay loam and 40% Imperial silty clay loam. Nearly level to gently sloping soils on valley floor (floodplains and old lake beds). Parent material consists of alluvium derived from mixed sources. Very deep and moderately well to well drained with low runoff potential and very slow permeability; nonsaline to slightly saline. Available water capacity is moderate to high. Severe rutting hazard. Used for native desert plants and irrigated cropland. Used mainly for grazing, cropland, and as wildlife habitat. Crops include cotton, sugar beats, alfalfa, barley, annual ryegrass, sorghums, flax, safflower, carrots, and lettuce. Farmland of statewide importance.	154 (1)

[a] Water erosion potential rates the hazard of soil loss from off-road and off-trail areas after disturbance activities that expose the soil surface. The ratings are based on slope and soil erosion factor K (whole soil; doesn't account for the presence of rock fragments) and represent soil loss caused by sheet or rill erosion where 50 to 75% of the surface has been exposed by ground disturbance. A rating of "slight" indicates that erosion is unlikely under ordinary climatic conditions. A rating of "very severe" indicates that significant erosion is expected; loss of soil productivity and damage are likely and erosion control measures are costly and generally impractical.

[b] To convert acres to km^2, multiply by 0.004047.

Footnotes continued on next page.

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TABLE 9.1.7.1-1 (Cont.)

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[c] WEG = wind erodibility group. WEGs are based on soil texture, content of organic matter, effervescence of carbonates, content of rock fragments, and mineralogy, and also take into account soil moisture, surface cover, soil surface roughness, wind velocity and direction, and the length of unsheltered distance (USDA 2004). Groups range in value from 1 (most susceptible to wind erosion) to 8 (least susceptible to wind erosion). The NRCS provides a wind erodibility index, expressed as an erosion rate in tons per acre per year, for each of the wind erodibility groups: WEG 1, 220 tons (200 metric tons) per acre (4,000 m^2) per year; WEG 2,134 tons (122 metric tons) per acre (4,000 m^2) per year; and WEG 4, 86 tons (78 metric tons) per acre (4,000 m^2) per year.

[d] Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and that is available for these uses. Farmland of statewide importance includes soils in NRCS’s land capability Class II and III that do not meet the criteria for Prime farmland, but may produce high yields of crops when treated and managed according to acceptable farming methods.

Source: NRCS (2010).

9.1.8 Minerals (Fluids, Solids, and Geothermal Resources)

9.1.8.1 Affected Environment

There are no existing locatable mining claims or oil and gas leases (BLM and USFS 2010a) within the proposed Imperial East SEZ. In June 2009, public land in the SEZ was closed to locatable mineral entry pending the outcome of this solar energy PEIS.

In the past, all of the area was leased for oil and gas, but no development occurred and the leases were closed (BLM and USFS 2010b). The area remains open for discretionary mineral leasing, including leasing for oil and gas, and other leasable minerals, and for disposal of salable minerals.

About 60% of the SEZ is included within a known geothermal resource area (KGRA) (BLM and USFS 2010b). There is an operating geothermal plant about 3 mi (4.8 km) northwest of the SEZ.

9.1.8.2 Impacts

If the area is identified by the BLM as an SEZ to be used for utility-scale solar development, it would continue to be closed to all incompatible forms of mineral development. Since there are no oil and gas leases in the area, it is assumed that there would be no significant impacts on these resources if the area were developed for solar energy production. Also, since the area does not contain existing mining claims, it is also assumed there would be no loss of locatable mineral production there in the future. Surface development for geothermal resources would also be foregone on 3,462 acres (14 km^2) within the KGRA.

If the area is identified as a solar energy development zone, some mineral uses might be allowed on all or portions of the SEZ. For example, oil and gas development that involves the use of directional drilling to access resources under the area (should any be found) might be allowed. It might also be possible to develop geothermal resources by using directional drilling techniques. The production of common minerals, such as sand and gravel and mineral materials used for road construction, might take place in areas not directly developed for solar energy production.

9.1.8.3 SEZ-Specific Design Features and Design Feature Effectiveness

Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program would provide adequate mitigation for protection of mineral resources with the possible exception of geothermal resources.

A proposed design features specific to the proposed SEZ includes the following:

- To protect the option for geothermal leasing under solar energy facilities, ROW authorizations for solar energy facilities should specifically note the potential for geothermal leasing with no surface occupancy stipulations.

9.1.9 Water Resources

9.1.9.1 Affected Environment

The proposed Imperial East SEZ is located within the Southern Mojave–Salton Sea subbasin of the California hydrologic region (USGS 2010c) and the Basin and Range physiographic province characterized by intermittent mountain ranges and desert valleys (Planert and Williams 1995). The proposed SEZ is within the desert landscape portion of the Imperial Valley and has surface elevations ranging between 75 and 125 ft (23 and 38 m) above sea level. This region of southern California is within the Colorado River subdivision of the Sonoran Desert, which is characterized as a hot and dry climate with summer high temperatures up to 120°F (48.8°C) and less than 3 in. (7.6 cm) of annual rainfall (ASDM 2010). The majority of the precipitation falls in the winter and spring months with occasional monsoonal thunderstorms (CDWR 2009). Evapotranspiration rates range between 57 and 75 in./yr (145 and 190 cm/yr) within the Imperial and Coachella Valleys (CIMIS 2010), and the average annual pan evaporation rate is 118 in./yr (300 cm/yr) (Cowherd et al. 1988; WRCC 2010a). While the Imperial Valley is a very arid region, it supports more than 450,000 acres (1,821 km^2) of farmland irrigated primarily by water diverted from the Colorado River (Layton 1978).

9.1.9.1.1 Surface Waters (Including Drainages, Floodplains, and Wetlands)

There are no surface water features located on the proposed Imperial East SEZ, but the Salton Sea, along with several irrigation canals and small washes, is found within the Imperial Valley, as shown in Figure 9.1.9.1-1. The All-American Canal flows along the southern boundary of the proposed SEZ. The canal diverts Colorado River water at the Imperial Dam, located 35 mi (56 km) east, to the agricultural fields of the Imperial Valley to the north and west of the proposed SEZ. Annual average flows in the All-American Canal coming out of the Colorado River ranged between 2.8 million and 3.7 million ac-ft/yr (3.5 billion and 4.6 billion m^3/yr) for the period from 1962 to 1992 (USGS 2010b; stream gauge 09527500). The canal has recently been lined with concrete to prevent seepage losses on a 23-mi (40-km) reach, which includes the portion along the southern boundary of the proposed SEZ (CDWR 2009; IID 2009). Diversions off the All-American Canal include the Coachella Canal (9 mi [14.5 km] east), East Highland Canal (4 mi [6.5 km] west), and Central Main Canal (14 mi [22.5 km] west of the proposed SEZ). The Alamo River and the New River are located 9 mi (14 km) and 23 mi (37 km) west of the proposed SEZ, respectively. Salinity is the primary water quality concern for Colorado River water that flows in the canals and rivers of the Imperial Valley, which typically have total dissolved solids concentrations (TDS) between 700 and 800 mg/L (Layton 1978; CRBSCF 2008).

The Salton Sea, located 37 mi (59.5 km) northwest of the proposed Imperial East SEZ (Figure 9.1.9.1-1), is California's largest inland water body, covering 230,000 acres (931 km^2) (CDWR 2009). The Salton Sea is the hydrologic sink for the Imperial Valley with no surface outflows and has a water surface elevation of 230 ft (70 m) below sea level. The majority of the Salton Sea's inflow comes from the Alamo and New Rivers, which are classified as impaired

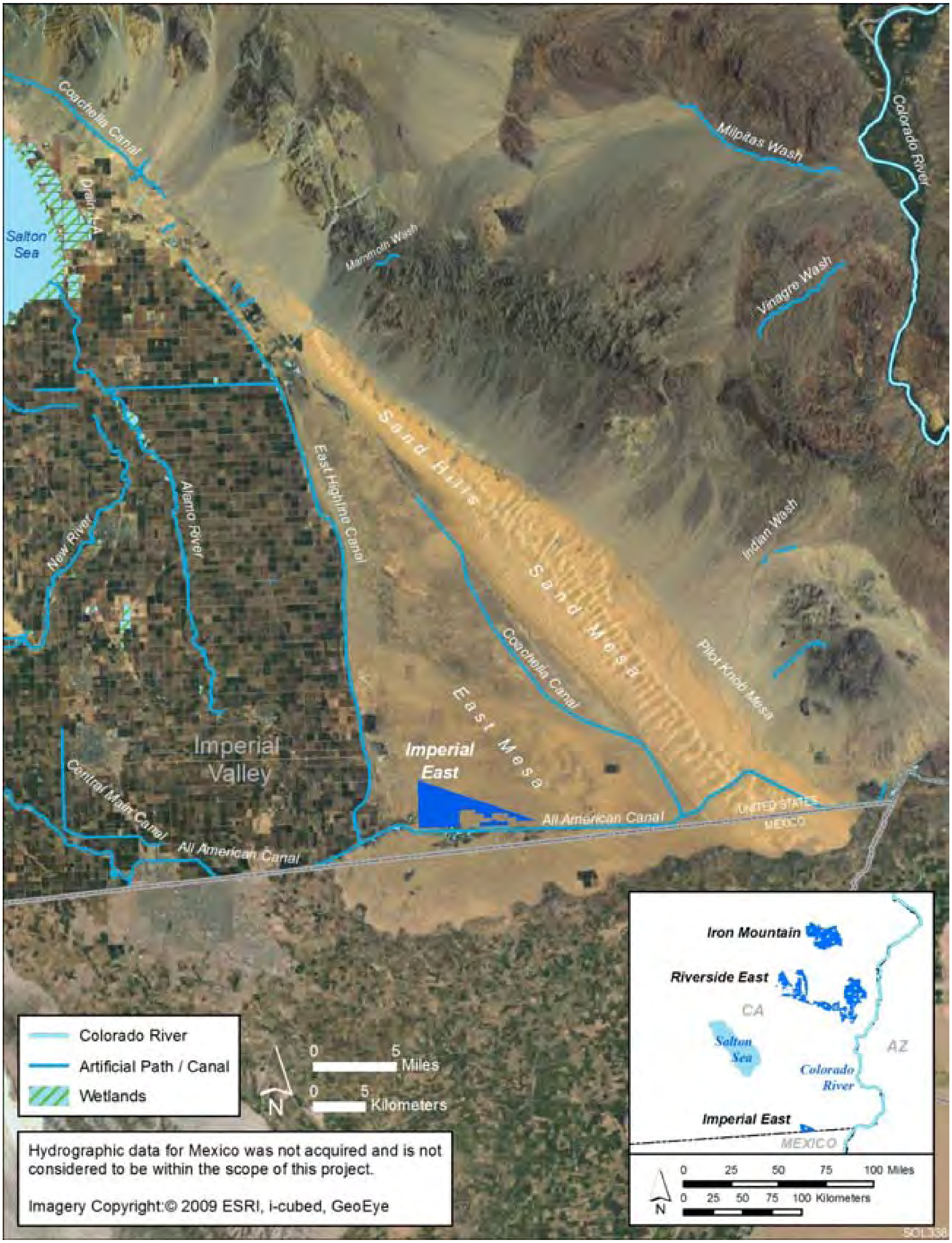

FIGURE 9.1.9.1-1 Surface Water Features near the Proposed Imperial East SEZ

water bodies because they primarily receive agricultural runoff and wastewater containing elevated pesticides, dissolved salts, and sediment concentrations (Orlando et al. 2008). The lack of surface outlets, high evaporation rates, and agricultural pollution have resulted in the Salton Sea having a higher salt content (46 g/L) than seawater (33 g/L) (Thompson et al. 2008).

Flood hazards for the majority of the Imperial Valley region are considered moderate (Zone X), and land within the proposed SEZ is classified as being susceptible to floods between the 100-year and 500-year events (FEMA 2009). While the Imperial Valley has an arid climate, the landscape has very little vegetation, and there are braided, ephemeral washes and drainage patterns that experience flash floods and debris flows during large storm events. These conditions, in combination with low-capacity stormwater infrastructure throughout the region, result in the potential for flooding during storm events (CDWR 2009).

The NWI identified several small palustrine wetlands located along the All-American Canal, which are described in more detail in Section 9.1.10.1. These wetlands are temporally flooded throughout the year, and the groundwater level is often below the land surface (USFWS 2009). Historically, these small wetlands have been supported by seepage water from the unlined All-American Canal, which has been recently lined. The IID, which operates the canal, is planning to create and enhance 44 acres (0.2 km^2) of wetlands located just along the southern boundary of the proposed SEZ as a mitigation measure for the canal lining project (IID 2010a).

9.1.9.1.2 Groundwater

The proposed Imperial East SEZ is located within the Imperial Valley groundwater basin and covers an area of 1.2 million acres (4,860 km^2), with its eastern boundary extending northwestward along the Sand Hills/Sand Mesa region and Chocolate Mountains toward the Salton Sea (Figure 9.1.9.1-1). The valley fill alluvium can be as deep as 20,000 ft (6,100 m) in the center of the valley and consists of Quaternary and Tertiary aged sediments; however, the water-bearing aquifers are found in the top 2,000 ft (610 m) (Loeltz et al. 1975). The top 2,000 ft (610 m) of alluvium is primarily unconfined and contains two main aquifers separated by a semipermeable layer averaging 60 ft (18 m) in thickness. The lower aquifer averages 380 ft (116 m) in thickness with a maximum thickness of 1,500 ft (457 m), while the upper aquifer averages 60 ft (18 m) in thickness with a maximum thickness of 280 ft (85 m) (CDWR 2003; groundwater basin number 7-30). These aquifers comprise silt, sand, and clays that originate from the Colorado River mixed with locally derived coarse sands and gravels (Loeltz et al. 1975). The upper aquifer also contains patches of up to 80 ft (24 m) of low-permeability lake deposits from the prehistoric Lake Cahuilla, which creates localized areas of confined conditions (CDWR 2003).

Recharge to the Imperial Valley groundwater basin is primarily through irrigation returns, Colorado River recharge, seepage under unlined canals, surface runoff from surrounding higher elevations, underflow from the Mexicali Valley to the south, and direct runoff and percolation of precipitation (CDWR 2003). Discharge of groundwater is primarily through irrigation withdrawals, losses to streams, and evapotranspiration (Thompson et al. 2008). A groundwater model based on data from 1970 to 1990 suggests that the total recharge by irrigation returns and seepage under canals was 250,000 ac-ft/yr (308 million m^3/yr) and underflow recharge was 173,000 ac-ft/yr (213 million m^3/yr), while total discharge from the basin was 439,000 ac-ft/yr (541 million m^3/yr) (CDWR 2003). Recharge by precipitation runoff and infiltration was estimated to be less than 10,000 ac-ft/yr (12 million m^3/yr) (Loeltz et al. 1975). It is very likely that the estimated value of recharge by seepage from unlined canals was overestimated, because in 1980 a 49-mi (79-km) reach of the Coachella Canal was lined with concrete, and in early 2010, lining of 23 mi (37 km) of the All-American Canal, including the reach along the south portion of the proposed Imperial East SEZ, is scheduled to be completed (CDWR 2003, 2009; IID 2009a). The newly lined portion of the canal is expected to save 67,700 ac-ft/yr (83.5 million m^3/yr) (IID 2009a).

The primary groundwater flow path follows the valley to the northwest in the direction of the Salton Sea. Transmissivity values vary across the Imperial Valley groundwater basin; values for fine-grained deposits typically range between 134 and 1,340 ft^2/day (12 and 125 m^2/day). Regions of higher transmissivity are located along the Sand Mesa area (Figure 9.1.9.1-1); values reach 114,000 ft^2/day (10,590 m^2/day). In general, transmissivity values decrease moving west and north from the Sand Mesa area (Loeltz et al. 1975).

The majority of groundwater wells in the Imperial Valley are used for irrigation and are located in the agricultural portion of the valley (5 mi [8 km] west of the proposed SEZ). Reported groundwater well yields range between 45 and 1,550 gpm (170 and 5,687 L/min) (Loeltz et al. 1975). Groundwater levels have remained steady in the region for several decades because of relatively constant recharge rates (CDWR 2003). Three U.S. Geological Survey (USGS) wells located in the desert portion of the Imperial Valley also show steady groundwater elevations ranging from 23 to 47 ft (7 to 14 m) below the surface (USGS 2010b; well numbers 324242115073501, 324340115073401, 324632115011001). Groundwater quality is a concern in the Imperial Valley because of high dissolved salts and agricultural chemical concentrations. TDS concentrations range from 498 to 7,280 mg/L; values often exceed 2,000 mg/L (CDWR 2003). Another potential water quality concern is that approximately 20% of the groundwater in this region has temperatures greater than 59°F (15°C), which is why this region is often considered for geothermal energy production (Dutcher et al. 1972).

9.1.9.1.3 Water Use and Water Rights Management

In 2005, water withdrawals from surface waters and groundwater in Imperial County were 2.4 million ac-ft/yr (2.9 billion m^3/yr), of which 98% came from surface waters and was used primarily for irrigating agricultural fields. The majority of this water is imported into the Imperial Valley from the Colorado River. Total groundwater withdrawals were 46,000 ac-ft/yr (57 million m^3/yr), which was used primarily for irrigation. Municipal and domestic water uses totaled 34,000 ac-ft/yr (42 million m^3/yr), and industrial and thermoelectric power uses totaled 3,000 ac-ft/yr (3.7 million m^3/yr) (Kenny et al. 2009).

To manage water resources, California uses a “plural” system, which consists of a mixture of riparian and prior appropriation doctrines for surface waters, a separate doctrine for groundwater, and pueblo rights (BLM 2001a). Several agencies are involved with the management of California's water resources, including federal, state, local, and water/irrigation districts. For example, water rights and water quality are managed by the State Water Board, while the Department of Water Resources manages water conveyance, infrastructure, and flood management (CDWR 2009). Surface water appropriations, for nonriparian rights, begin with a permit application to the State Water Board and a review process that examines the application's beneficial use, pollution potential, and water quantity availability; the permitting, review, and licensing procedure should not take more than 6 months to complete unless the application is protested (BLM 2001a).

Groundwater management in California is primarily done at the local level of government through local agencies or ordinances; it can also be subject to court adjudications. State statute assigns authority and revenue mechanisms to several types of local agencies to provide water for beneficial uses, as well as to manage withdrawals in order to prevent overdraft[6] of the aquifers. Local ordinances (typically at the county level) also can be used to manage groundwater resources and have been adopted in 27 counties in California. Many of these local groundwater ordinances are focused on controlling water exports out of the basin through permitting processes. Court adjudications are the strongest form of groundwater management used in California and often result in the creation of a court-appointed "watermaster" agency to manage withdrawals for all users to ensure that the court-determined safe yield[7] is maintained (CDWR 2003).

Water resources potentially available for solar energy development at the proposed Imperial East SEZ are imported Colorado River water and groundwater. Imported Colorado River water via the All-American Canal is controlled by the IID, which is a public entity that delivers Colorado River water to the agricultural regions of the Imperial Valley, supports and maintains water infrastructure (e.g., canals, tile drainage systems, pumping stations), and implements water conservation measures (IID 2005). Although the IID primarily supports irrigation for agriculture, Section 22121 of the California water code allows organizations such as the IID to appropriate water for energy production. The IID currently allows up to 25,000 ac-ft/yr (30.8 million m^3/yr) to be used for non-agricultural uses within its service area (IID 2009b). However, given the high demand of water for agricultural purposes and the limited supply of Colorado River water, it is highly unlikely that IID water could be used to support projects seeking large volumes of water for non-irrigation uses (Layton 1978; Anderholdt-Shields 2010).

Groundwater withdrawals to support solar energy development are subject to the Imperial County groundwater ordinance (Groundwater Management, Title 9, Division 22). The permitting of new groundwater wells is reviewed by the county's groundwater planning commission, which oversees all groundwater extractions, exports, and artificial recharge applications. In addition,

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6 Groundwater overdraft is the condition in which water extractions from an aquifer exceed recharge processes in such excess as to cause substantial and sustained decreases in groundwater flows and groundwater elevations.

7 Safe yield is the amount of groundwater that can be withdrawn from a groundwater basin over a period of time without exceeding the long-term recharge of the basin or unreasonably affecting the basin's physical and chemical integrity.

the county groundwater planning commission has the authority to manage the groundwater resources in terms of quantifying groundwater storage capacity, acquiring water rights, requiring water conservations practices, and limiting groundwater withdrawal rates.

9.1.9.2 Impacts

Potential impacts on water resources related to utility-scale solar energy development include direct and indirect impacts on surface waters and groundwater. Direct impacts occur at the place of origin and at the time of the proposed activity, while indirect impacts occur away from the place of origin or later in time. Impacts on water resources considered in this analysis are the result of land disturbance activities (construction, final developed site plan, as well as off-site activities such as road and transmission line construction) and water use requirements for solar energy technologies that take place during the four project phases: site characterization, construction, operations, and decommissioning/reclamation. Both land disturbance and consumptive water use activities can affect groundwater and surface water flows, cause drawdown of groundwater surface elevations, modify natural drainage pathways, obstruct natural recharge zones, and alter surface water-wetland-groundwater connectivity. Water quality can also be degraded through the generation of wastewater, chemical spills, increased erosion and sedimentation, and increased salinity (e.g., by the excessive withdrawal from aquifers).

9.1.9.2.1 Land Disturbance Impacts on Water Resources

Impacts related to land disturbance activities are common to all utility-scale solar energy facilities, which are described in more detail for the four phases of development in Section 5.9.1; these impacts will be minimized through the implementation of programmatic design features described in Appendix A, Section A.2.2. In addition to the hydrologic evaluation (including identifying 100-year floodplains and jurisdictional waters) described in the design features (Appendix A, Section A.2.2), coordination and permitting with the California Department of Fish and Game (CDFG) would be needed for any proposed alterations of surface water features (both perennial and ephemeral) in accordance with the Lake and Streambed Alteration Program (CDFG 2010c). Runoff of water and sediments from the proposed Imperial East SEZ could impair the existing wetlands along the All-American Canal and mitigation wetlands associated with the canal lining project. Siting of solar energy facilities and land disturbance should avoid interfering with natural drainage patterns near the southern boundary of the proposed SEZ, where wetland areas could be affected.

9.1.9.2.2 Water Use Requirements for Solar Energy Technologies

Analysis Assumptions

A detailed description of the water use assumptions for the four utility-scale solar energy technologies (parabolic trough, power tower, dish engine, and PV systems) is presented in

Appendix M. Assumptions regarding water use calculations specific to the proposed Imperial East SEZ are as follows:

- On the basis of a total area of less than 10,000 acres (40 km^2), it is assumed that one solar project would be constructed during the peak construction year;

- Water needed for making concrete would come from an off-site source.

- The maximum land area disturbed for an individual solar facility during the peak construction year is assumed to be 3,000 acres (12 km^2);

- Assumptions on individual facility size and land requirements (Appendix M) along with the assumed number of projects and maximum allowable land disturbance, result in the potential to disturb up to 52% of the SEZ total area during the peak construction year;

- Water use requirements for hybrid cooling systems are assumed to be on the same order of magnitude as those using dry cooling (see Section 5.9.2.1); and

- For the purposes of this analysis, Colorado River water from the All-American Canal is assumed to be unavailable for wet- and dry-cooling purposes at solar energy developments because of two factors: (1) negotiation with IID for canal water would have to be done on a project-specific basis, and (2) limited water availability and irrigation demands in the Imperial Valley suggest minimal canal water would be available (see Section 9.1.9.1.3 for more details).

Site Characterization

During site characterization, water would be used mainly for fugitive dust control and the workforce potable water supply. Impacts on water resources during this phase of development are expected to be negligible, because activities would be limited in area, extent, and duration; water needs could be met by trucking water in from an off-site source.

Construction

During construction, water would be used mainly for fugitive dust control and the workforce potable water supply. Because there are no significant surface water bodies on the proposed Imperial East SEZ, the water requirements for construction activities could be met by either trucking water to the sites or by using on-site groundwater resources (the potential for using All-American Canal water for construction activities, except for potable supply, is considered infeasible for the purposes of this analysis given the relatively short duration of construction activities with respect to the logistical issues of conveying canal water to the proposed SEZ). Water requirements for dust suppression and potable water supply during the peak construction year, which are shown in Table 9.1.9.2-1, could be as high as 2,074 ac-ft (2.6 million m^3). In addition, up to 74 ac-ft (91,300 m^3) of sanitary wastewater would be generated and would need to be treated either on-site or sent to an off-site facility.

Groundwater wells would have to yield an estimated 883 to 1,284 gpm (3,343 to 4,860 L/min) to meet the water requirements estimated for construction. These yields are on the order of large municipal and agriculture production wells (Harter 2003) and similar in magnitude to reported well yields found in the Imperial Valley (Loeltz et al. 1975). Groundwater used for a potable supply must have a TDS of less than 1,500 mg/L and is recommended to be less than 500 mg/L to meet secondary maximum contaminant levels (*California Code*, Title 22, Article 16, Section 64449). Given the potential for high TDS values in the groundwater of the Imperial Valley groundwater basin, workforce water supplies may have to be brought in from off-site regardless of the availability of groundwater.

Operations

During operations, water would be required for mirror/panel washing, the workforce potable water supply, and cooling (parabolic trough and power tower only) (Table 9.1.9.2-2). Water needs for cooling are a function of the type of cooling used (dry, wet, or hybrid). Further refinements to water requirements for cooling would result from the percentage of time that the option was employed (30 to 60% range assumed) and the power of the system. The differences between the water requirements reported in Table 9.1.9.2-2 for the parabolic trough and power

TABLE 9.1.9.2-1 Estimated Water Requirements during the Peak Construction Year for the Proposed Imperial East SEZ

Activity	Parabolic Trough	Power Tower	Dish Engine	PV
Water use requirements[a]				
Fugitive dust control (ac-ft)[b,c]	1,352	2,029	2,029	2,029
Potable supply for workforce (ac-ft)	74	45	19	9
Total water use requirements (ac-ft)	1,426	2,074	2,048	2,038
Wastewater generated				
Sanitary wastewater (ac-ft)	74	45	19	9

[a] Assumptions of water use for fugitive dust control, potable supply for workforce, and wastewater generation are presented in Appendix M.

[b] Fugitive dust control estimation assumes a local pan evaporation rate of 118 in./yr (300 cm/yr) (Cowherd et al. 1988; WRCC 2010a).

[c] To convert ac-ft to m^3, multiply by 1,234.

TABLE 9.1.9.2-2 Estimated Water Requirements during Operations at Full Build-out Capacity at the Proposed Imperial East SEZ

Activity	Parabolic Trough	Power Tower	Dish Engine	PV
Full build-out capacity (MW)[a,b]	916	509	509	509
Water use requirements				
Mirror/panel washing (ac-ft/yr)[c,d]	458	254	254	25
Potable supply for workforce (ac-ft/yr)	13	6	6	1
Dry cooling (ac-ft/yr)[e]	183–916	102–509	NA[f]	NA
Wet cooling (ac-ft/yr)[e]	4,120–13,275	2,289–7,375	NA	NA
Total water use requirements				
Non-cooled technologies (ac-ft/yr)	NA	NA	260	26
Dry-cooled technologies (ac-ft/yr)	654–1,387	362–769	NA	NA
Wet-cooled technologies (ac-ft/yr)	4,591–13,746	2,549–7,635	NA	NA
Wastewater generated				
Blowdown (ac-ft/yr)[g]	260	144	NA	NA
Sanitary wastewater (ac-ft/yr)	13	6	6	1

a Land area for parabolic trough was estimated at 5 acres/MW (0.02 km^2/MW); land area for the power tower, dish engine, and PV technologies was estimated at 9 acres/MW (0.04 km^2/MW).

b Water needs are linearly related to power. Water usage for any other size project can be estimated by using multipliers provided in Table M.9-2 (Appendix M).

c Value assumes a usage rate of 0.5 ac-ft/yr/MW for mirror washing for parabolic trough, power tower, and dish engine technologies and a rate of 0.05 ac-ft/yr/MW for panel washing for PV systems.

d To convert ac-ft to m^3, multiply by 1,234.

e Dry-cooling value assumes 0.2 to 1.0 ac ft/yr per MW and wet-cooling value assumes 4.5 to 14.5 ac ft/yr per MW (range in these values represents 30 and 60% operating times) (DOE 2009).

f NA = not applicable.

g Value scaled from 250-MW Beacon Solar project with an annual discharge of 44 gpm (167 L/min) (AECOM 2009). Blowdown estimates are relevant to wet cooling only.

tower technologies are attributable to the assumptions of acreage per megawatt. As a result, the water usage for the more energy-dense parabolic trough technology is estimated to be almost twice as large as that for the power tower technology.

At full build-out capacity, water needs for mirror/panel washing are estimated to range from 25 to 458 ac-ft/yr (31,000 to 565,000 m^3/yr) and workforce potable water up to 13 ac-ft/yr (16,000 m^3/yr). The maximum total water usage during operations at full-build-out capacity would be greatest for those technologies using the wet-cooling option and is estimated to be as high as 13,746 ac-ft/yr (17 million m^3/yr). Water usage for dry-cooling systems would be as high as 1,387 ac-ft/yr (1.7 million m^3/yr), approximately a factor of 10 times less than that for the wet-cooling option. Non-cooled technologies—dish engine and PV systems—require substantially less water at full build-out capacity, at 260 ac-ft/yr (320,700 m^3/yr) for dish engine and 26 ac-ft/yr (32,100 m^3/yr) for PV (Table 9.1.9.2-2). Operations would produce up to 13 ac-ft/yr (16,000 m^3/yr) of sanitary wastewater; in addition, for wet-cooled technologies, up to 260 ac-ft/yr (320,700 m^3/yr) of cooling system blowdown water would need to be treated either on- or off-site. Any on-site treatment of wastewater would have to ensure that treatment ponds are effectively lined in order to prevent any groundwater contamination.

Groundwater is the primary water resource available for solar energy development at the proposed Imperial East SEZ. The estimates of recharge and discharge processes, along with information on groundwater levels presented previously, suggest that the overall groundwater balance is at a state of equilibrium. However, further characterization of the alluvial aquifers of the Imperial Valley groundwater basin is needed to fully address the impacts of increased groundwater withdrawals for solar energy development. It is estimated that the newly lined portion of the All-American Canal near the southern boundary of the proposed SEZ will eliminate up to 67,700 ac-ft/yr (83.5 million m^3/yr) of recharge to the local aquifer. Loeltz et al. (1975) reported well yields ranging between 45 and 1,550 gpm in the Imperial Valley, which is equivalent to 72 and 2,500 ac-ft/yr (89,000 and 1.9 million m^3/yr). Given these values of historical well yields, anticipated losses in groundwater recharge, and the estimated water requirements presented in Table 9.1.9.2-2, water use requirements could be sustainable by groundwater resources for technologies using dry-cooling, dish engine, and PV systems. The water use estimates for wet-cooling technologies could potentially cause groundwater drawdown, given that they are a factor of 1 to 5 times greater than the largest historical well yields of the Imperial Valley, and that local groundwater recharge will decrease due to the lining of the All-American Canal. The potential use of All-American Canal water would have to be negotiated with the IID on a project-specific basis, but it is likely that water use estimates for dish engine and PV technologies could be supported by the IID’s allocation for non-agricultural uses (IID 2009b; Anderholdt-Shields 2010).

Groundwater drawdown that could potentially occur as a result of solar energy development could potentially disrupt groundwater flow patterns in the Imperial Valley, but greater concerns are associated with the land subsidence that has been observed in the valley (Layton 1978). Land subsidence could cause cracks in the newly lined All-American Canal and affect water quantities and rights of the IID. An additional concern of using groundwater for solar energy development is the poor quality of the groundwater that is typically found in the Imperial Valley. As mentioned previously, the potable water supply for the workforce may need to brought in from off-site (potentially from the All-American Canal) or the groundwater may need to be treated to reduce TDS values to meet California requirements. The TDS values of the groundwater are potentially high enough to cause corrosion and fouling of infrastructure (Layton 1978).

Decommissioning/Reclamation

During decommissioning/reclamation, all surface structures associated with the solar project would be dismantled, and the site reclaimed to its pre-construction state. Activities and water needs during this phase would be similar to those during the construction phase (dust suppression and potable supply for workers) and may also include water to establish vegetation in some areas. However, the total volume of water needed is expected to be less. Because quantities of water needed during the decommissioning/reclamation phase would be less than those for construction, impacts on surface and groundwater resources also would be less.

9.1.9.2.3 Off-Site Impacts: Roads and Transmission Lines

Impacts associated with the construction of roads and transmission lines primarily deal with water use demands for construction, water quality concerns relating to potential chemical spills, and land disturbance effects on the natural hydrology. The extent of the impacts on water resources is proportional to the amount and location of land disturbance needed to connect the proposed SEZ to major roads and existing transmission lines. The proposed Imperial East SEZ is located adjacent to existing roads and transmission lines, as described in Section 9.1.1.2, so it is assumed that no additional construction outside of the SEZ would be required and there would be no impacts.

9.1.9.2.4 Summary of Impacts on Water Resources

The impacts on water resources associated with developing solar energy in the proposed Imperial East SEZ are associated with land disturbance effects on natural hydrology, water use requirements for the various solar energy technologies, and water quality concerns. Land disturbance impacts are of specific concern along the southern boundary of the proposed SEZ, because excess water and sediment runoff could impair the existing and mitigation wetland areas along the All-American Canal.

Impacts relating to water use requirements vary depending on the type of solar technology built and, for technologies using cooling systems, the type of cooling (wet, dry, hybrid) employed. The recent lining of the All-American Canal along the southern boundary of the proposed SEZ is expected to drastically decrease the local groundwater recharge of the area. Given the water use estimates for the various solar energy technologies, dry-cooled parabolic trough and power tower, along with dish engine and PV systems, could be feasible with respect to the availability of groundwater resources. In addition, dish engine and PV technologies could potentially be supported by All-American Canal water supplied by the IID, but would have to be negotiated on a project-specific basis. Parabolic trough and power tower technologies using wet cooling have the potential to cause groundwater drawdown and possibly land subsidence. Given this analysis of available water resources, wet cooling would not be considered feasible for the full build-out scenario of the proposed Imperial East SEZ

Water quality of the groundwater in the Imperial Valley is of concern because of its high salts concentrations and potential for agricultural chemical pollution. Potable water from supply sources may not be obtainable from the groundwater aquifers without considerable treatment; thus bringing water in from off-site (potentially All-American Canal water) may be needed during all phases of solar energy projects. Additional concerns regarding groundwater TDS values that could potentially be corrosive to solar facility infrastructure would have to be addressed during the site characterization phase.

9.1.9.3 SEZ-Specific Design Features and Design Feature Effectiveness

The program for solar energy development on BLM-administered lands will require implementation of the programmatic design features described in Appendix A, Section A.2.2, thus mitigating some impacts on water resources. Programmatic design features would focus on coordination with federal, state, and local agencies that regulate the use of water resources to meet the requirements of permits and approvals needed to obtain water for development, and on hydrological studies to characterize the aquifer from which groundwater would be obtained (including drawdown effects, if a new point of diversion were created). The greatest consideration for mitigating water impacts would be in the selection of solar technologies. The mitigation of impacts would be best achieved by selecting technologies with low water demands.

Proposed design features specific to the proposed Imperial East SEZ include the following:

- Water resource analysis indicates that wet-cooling options would not be feasible. Other technologies should incorporate water conservation measures.

- Land disturbance activities should avoid impacts in the vicinity of the existing and mitigation wetlands located along the southern boundary of the site.

- During site characterization, hydrologic investigations would need to identify 100-year floodplains and potential jurisdictional water bodies subject to Clean Water Act Section 404 permitting. Siting of solar facilities and construction activities should avoid areas identified as being within a 100-year floodplain.

- During site characterization, coordination and permitting with CDFG regarding California’s Lake and Streambed Alteration Program would be required for any proposed alterations to surface water features (both perennial and ephemeral).

- The groundwater-permitting process should be in compliance with the Imperial County groundwater ordinance.

- Groundwater monitoring and production wells should be constructed in accordance with standards set forth by the State of California (CDWR 1991) and Imperial County.

- Stormwater management plans and BMPs should comply with standards developed by the California Stormwater Quality Association (CASQA 2003).

- Water for potable uses should meet or be treated to meet the water quality standards of the California Safe Drinking Water Act (*California Health and Safety Code*, Chapter 4).

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9.1.10 Vegetation

This section addresses vegetation that could occur or is known to occur within the potentially affected area of the proposed Imperial East SEZ. The affected area considered in this assessment included the areas of direct and indirect effects. The area of direct effects was defined as the area that would be physically modified during project development (i.e., where ground-disturbing activities would occur) and included only the SEZ. The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary where ground-disturbing activities would not occur but that could be indirectly affected by activities in the area of direct effect. No area of direct or indirect effects was assumed for new transmission lines or access roads, because they are not expected to be needed for developments on the Imperial East SEZ because of the proximity of an existing transmission line and state highway.

Indirect effects considered in the assessment included effects from surface runoff, dust, and accidental spills from the SEZ, but did not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance from the SEZ. This area of indirect effects was identified on the basis of professional judgment and was considered sufficiently large to bound the area that would potentially be subject to indirect effects. The affected area is the area bounded by the areas of direct and indirect effects. These areas are defined and the impact assessment approach is described in Appendix M.

9.1.10.1 Affected Environment

The proposed Imperial East SEZ is located within the Sonoran Basin and Range Level III ecoregion (EPA 2007), which supports creosotebush (*Larrea tridentata*) and white bursage (*Ambrosia dumosa*) plant communities with large areas of palo verde (*Cercidium microphyllum*)-cactus shrub and saguaro cactus (*Carnegiea gigantea*) communities (EPA 2002). The dominant species of the Lower Colorado River Valley subdivision of the Sonoran Desert are primarily creosotebush, white bursage, and all-scale (*Atriplex polycarpa*), with big galleta (*Pleuraphis rigida*), Palmer alkali heath (*Frankenia palmeri*), brittlebush (*Encelia farinosa*), and western honey mesquite (*Prosopis glandulosa* var. *torreyana*) are dominant in some areas (Turner and Brown 1994). Larger drainageways and washes support species of small trees and shrubs that may also occur in adjacent areas, such as western honey mesquite, ironwood (*Olneya tesota*), and blue palo verde (*Cercidium floridum*), as well as species such as smoketree (*Psorothamnus spinosa*), which are mostly restricted to drainageways. Shrub species found in minor drainages include cat-claw acacia (*Acacia greggii*), burrobrush (*Hymenoclea salsola* var. *pentalepis*), Anderson thornbush (*Lycium andersonii*), and desert broom (*Baccharis sarothroides*). Annual precipitation in the Sonoran Desert occurs in winter and summer (Turner and Brown 1994) and is very low in the area of the SEZ, averaging about 2.7 in. (6.8 mm), at Calexico (see Section 9.1.13).

Land cover types, described and mapped under the California Gap Analysis Program (CAReGAP) (NatureServe 2009) were used to evaluate plant communities in and near the SEZ. Each cover type encompasses a range of similar plant communities. Land cover types occurring within the potentially affected area of the proposed Imperial East SEZ are shown in

Figure 9.1.10.1-1. Table 9.1.10.1-1 provides the surface area of each cover type within the potentially affected area.

Lands within the Imperial East SEZ are classified primarily as Sonora-Mojave Creosotebush-White Bursage Desert Scrub. The North American Warm Desert Active and Stabilized Dune cover type increases from west to east across the SEZ, becoming the dominant cover type east of the SEZ. Additional cover types within the SEZ are given in Table 9.1.10.1-1. Creosote was observed to be the dominant species over most of the SEZ in August 2009, with quail brush (*Atriplex lentiformis*) codominant in some northern areas. Stabilized dunes, considered sensitive habitats, support mesquite hummocks and clumps of Mormon tea (*Ephedra trifurca*) and creosote. Sensitive habitats on the SEZ also include wetlands, desert dry washes, and riparian areas. A characteristic Sonoran Desert species observed on the SEZ is western honey mesquite.

The area surrounding the SEZ, within 5 mi (8 km), includes 16 cover types, which are listed in Table 9.1.10.1-1. The predominant cover types are Sonora-Mojave Creosotebush-White Bursage Desert Scrub and North American Warm Desert Active and Stabilized Dune. The SEZ and affected area occur in California and a small portion of northern Mexico (Figure 9.1.10.1-1). Cover types are mapped only for the U.S. portions of the indirect impact area; the remaining portions are unmapped.

One wetland mapped by the *National Wetlands Inventory* (NWI) extends into the south-central portion of the SEZ, south of State Route 98 (USFWS 2009). The wetland is supported by seepage from the All-American Canal, located to the south (Figure 9.1.10.1-2) of the SEZ, and is classified as a palustrine wetland with a scrub-shrub plant community that is temporarily flooded. NWI maps are produced from high-altitude imagery and are subject to uncertainties inherent in image interpretation (USFWS 2009). The All-American Canal was not lined in this section of the canal partly because of the high value of these wetlands. In addition, these wetlands were enhanced to offset impacts from the All-American Canal lining project; therefore, they are considered a mitigation area to support nesting Yuma clapper rail (see Section 9.1.12). Approximately 5 acres (0.02 km^2) of the wetland is located within the SEZ and primarily mapped as the North American Warm Desert Riparian Woodland and Shrubland cover type. The wetland communities are characterized by the dominance of either tamarisk (*Tamarix* spp.) or arrow-weed (*Tessaria sericea*) (BOR 2006). Numerous ephemeral dry washes occur within the SEZ. These dry washes typically contain water for short periods during or following precipitation events, and include temporarily flooded areas, but typically do not support wetland or riparian habitats. Several shallow drainages in the west and south-central portions of the SEZ, however, support dense stands of woody vegetation that are mapped as North American Warm Desert Riparian Woodland and Shrubland, although these areas are not identified as wetlands. Mesquite and arrow-weed occur in some drainages in the western portion of the SEZ.

Wetlands within the 5 mi (8 km) indirect impact area include those associated with the All-American Canal. The canal is classified as a riverine wetland that is sparsely vegetated, with less than 30% plant cover. Common reed (*Phragmites australis*), an invasive native species, is abundant along the canal margin in many areas. Tamarisk, a non-native woody invasive, also

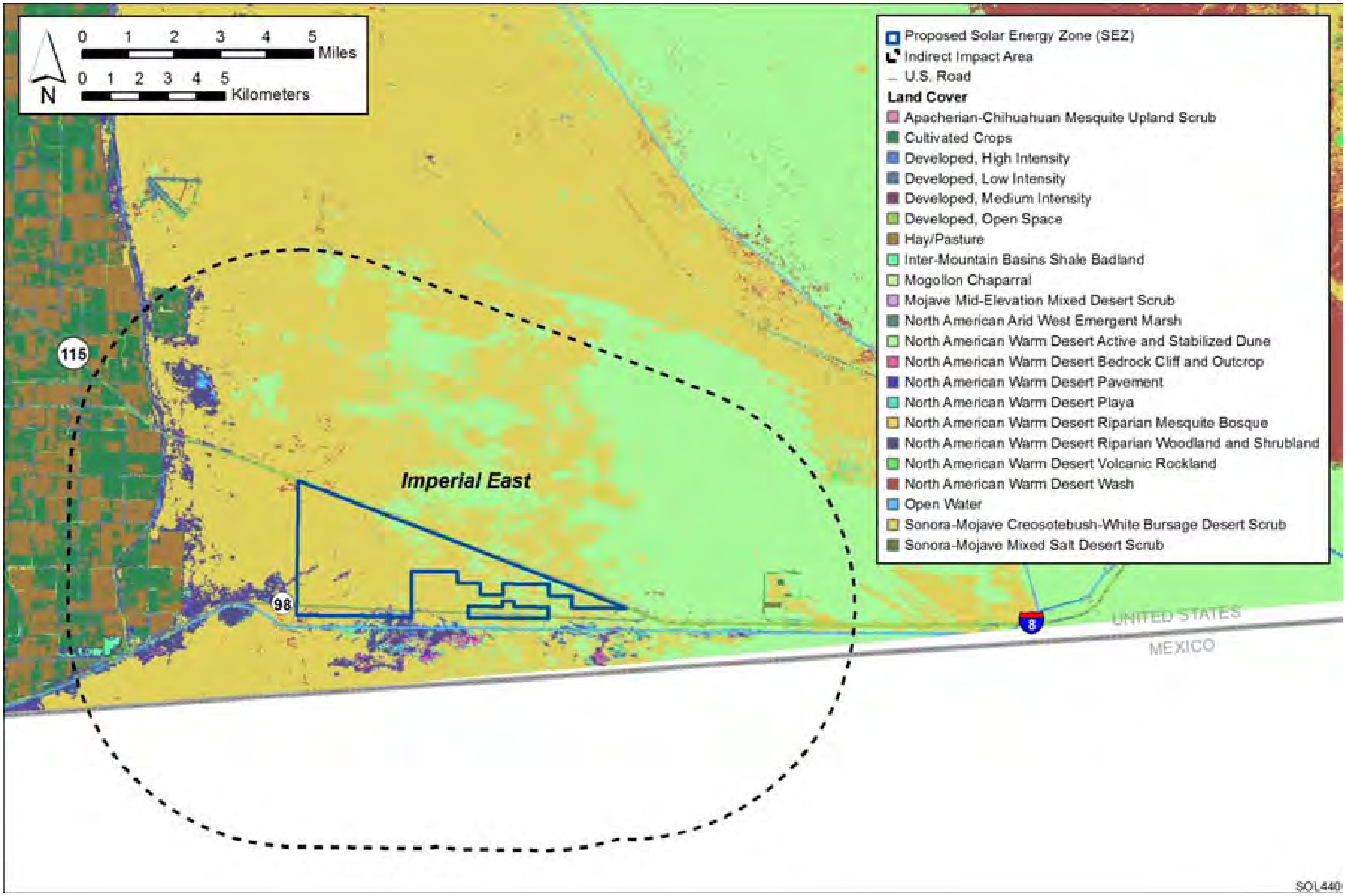

FIGURE 9.1.10.1-1 Land Cover Types within the Proposed Imperial East SEZ (Source: NatureServe 2009)

TABLE 9.1.10.1-1 Land Cover Types within the Potentially Affected Area of the Proposed Imperial East SEZ and Potential Impacts

	Area of Cover Type in Affected Areas (acres)[b]		
Land Cover Type[a]	Within SEZ[c] (Direct Effects)	Outside SEZ[d] (Indirect Effects)	Overall Impact Magnitude[e]
5264 Sonora-Mojave Creosotebush-White Bursage Desert Scrub: Occurs in broad valleys, lower bajadas, plains, and low hills in the Mojave and Sonoran Deserts. Shrubs form a sparse to moderately dense cover (2 to 50%), although the ground surface may be mostly barren. The dominant species are typically creosotebush (*Larrea tridentata*) and white bursage (*Ambrosia dumosa*). Other shrubs, dwarf shrubs, and cacti may also be dominant or form sparse understories. Herbaceous species are typically sparse, but may be seasonally abundant.	4,631 acres[f] (0.5%, 1.1%)	35,911 acres (3.6%)	Small
3121 North American Warm Desert Active and Stabilized Dune: Consists of unvegetated to sparsely vegetated (generally <10% plant cover) active dunes and sand sheets. Vegetation includes shrubs, forbs, and grasses. Includes unvegetated “blowouts” and stabilized areas.	705 acres (0.4%, 0.4%)	24,102 acres (12.7%)	Small
21, 22 Developed, Open Space–Low Intensity: Includes housing, parks, golf courses, and other areas planted in developed settings. Impervious surfaces compose up to 49% of the total land cover.	230 acres (0.4%, 3.2%)	1,907 acres (3.1%)	Small
9182 North American Warm Desert Riparian Woodland and Shrubland: Occurs along medium to large perennial streams in canyons and desert valleys. Consists of a mix of riparian woodlands and shrublands. Vegetation is dependent upon annual or periodic flooding, along with substrate scouring, and/or a seasonally shallow water table.	44 acres (0.1%, 0.4%)	3,226 acres (4.1%)	Small
9151 North American Warm Desert Wash: Consists of intermittently flooded linear or braided strips within desert scrub or grassland landscapes on bajadas, mesas, plains, and basin floors. Although often dry, washes are associated with rapid sheet and gully flow. The vegetation varies from sparse and patchy to moderately dense and typically occurs along the banks, but may occur within the channel. Shrubs and small trees are typically intermittent to open. Common upland shrubs often occur along the edges.	34 acres (<0.1%, <0.1%)	343 acres (0.1%)	Small

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TABLE 9.1.10.1-1 (Cont.)

	Area of Cover Type in Affected Areas (acres)[b]		
Land Cover Type[a]	Within SEZ[c] (Direct Effects)	Outside SEZ[d] (Indirect Effects)	Overall Impact Magnitude[e]
3120 North American Warm Desert Bedrock Cliff and Outcrop: Occurs on subalpine to foothill steep cliff faces, narrow canyons, rock outcrops, unstable scree and talus slopes. Consists of barren and sparsely vegetated areas (generally <10% plant cover) with desert species, especially succulents. Lichens are predominant in some areas.	33 acres (<0.1%, <0.1%)	540 acres (0.3%)	Small
3139 Inter-Mountain Basins Shale Badland: Typically occurs on rounded hills and plains. Consists of barren and sparsely vegetated areas (<10% plant cover) with high rate of erosion and deposition. Vegetation consists of sparse dwarf shrubs and herbaceous plants.	33 acres (0.4%, 0.7%)	793 acres (10.2%)	Small
3143 North American Warm Desert Pavement: Consists of unvegetated to very sparsely vegetated (<2% plant cover) areas, usually in flat basins, with ground surfaces of fine to medium gravel coated with "desert varnish." Desert scrub species are usually present. Herbaceous species may be abundant in response to seasonal precipitation.	11 acres (<0.1%, <0.1%)	473 acres (0.5%)	Small
3180 North American Warm Desert Volcanic Rockland: Consists of barren and sparsely vegetated (<10% plant cover) areas. Vegetation is variable and typically includes scattered desert shrubs.	<1 acres (<0.1%, <0.1%)	31 acres (<0.1%)	Small
81, 82 Hay/Pasture, Cultivated Crops: Areas where pasture/hay or cultivated crops account for more than 20% of the total land cover.	0 acres	7,502 acres (1.3%)	Small
11 Open Water: Plant or soil cover is generally less than 25%.	0 acres	644 acres (0.6%)	Small
23, 24 Developed, Medium-High Density: Includes housing and commercial/industrial development. Impervious surfaces compose 50 to 100% of the total land cover.	0 acres	9 acres (<0.1%)	Small

TABLE 9.1.10.1-1 (Cont.)

	Area of Cover Type in Affected Areas (acres)[b]		
Land Cover Type[a]	Within SEZ[c] (Direct Effects)	Outside SEZ[d] (Indirect Effects)	Overall Impact Magnitude[e]
3161 North American Warm Desert Playa: Consists of barren and sparsely vegetated areas (generally <10% plant cover) that are intermittently flooded; salt crusts are common. Sparse shrubs occur around the margins, and patches of grass may form in depressions. In large playas, vegetation forms rings in response to salinity. Herbaceous species may be periodically abundant.	0 acres	2 acres (0.1%)	Small
5265 Sonora-Mojave Mixed Salt Desert Scrub: Extensive open-canopied shrublands in the Mojave and Sonoran Deserts, usually occurring around playas and in valley bottoms or basins with saline soils. Vegetation is typically composed of one or more *Atriplex* species; other salt-tolerant plants are often present or even codominant. Grasses occur at varying densities.	0 acres	1 acre (<0.1%)	Small

[a] Land cover descriptions are from NatureServe (2009). Full descriptions of land cover types, including plant species, can be found in Appendix I.

[b] Area in acres, determined from Sanborn Mapping (2008).

[c] Includes the area of the cover type within the SEZ, the percentage that area represents of all occurrences of that cover type within the SEZ region (i.e., a 50-mi [80-km] radius from the center of the SEZ), and the percentage that area represents of all occurrences of that cover type on BLM lands within the SEZ region. The SEZ region intersects portions of California, Arizona, and northern Mexico. However, the SEZ and affected area occur only in California and a small portion of northern Mexico.

[d] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary where ground-disturbing activities would not occur. Indirect effects include effects from surface runoff, dust, and other factors from project facilities. The potential degree of indirect effects would decrease with increasing distance from the SEZ. Includes the area of the cover type within the indirect effects area and the percentage that area represents of all occurrences of that cover type within the SEZ region.

[e] Overall impact magnitude categories were based on professional judgment and were (1) *small*: a relatively small proportion ($\leq$1%) of the cover type within the SEZ region would be lost; (2) *moderate*: an intermediate proportion (>1 but $\leq$10%) of a cover type would be lost; (3) *large*: >10% of a cover type would be lost.

[f] To convert acres to km^2, multiply by 0.004047.

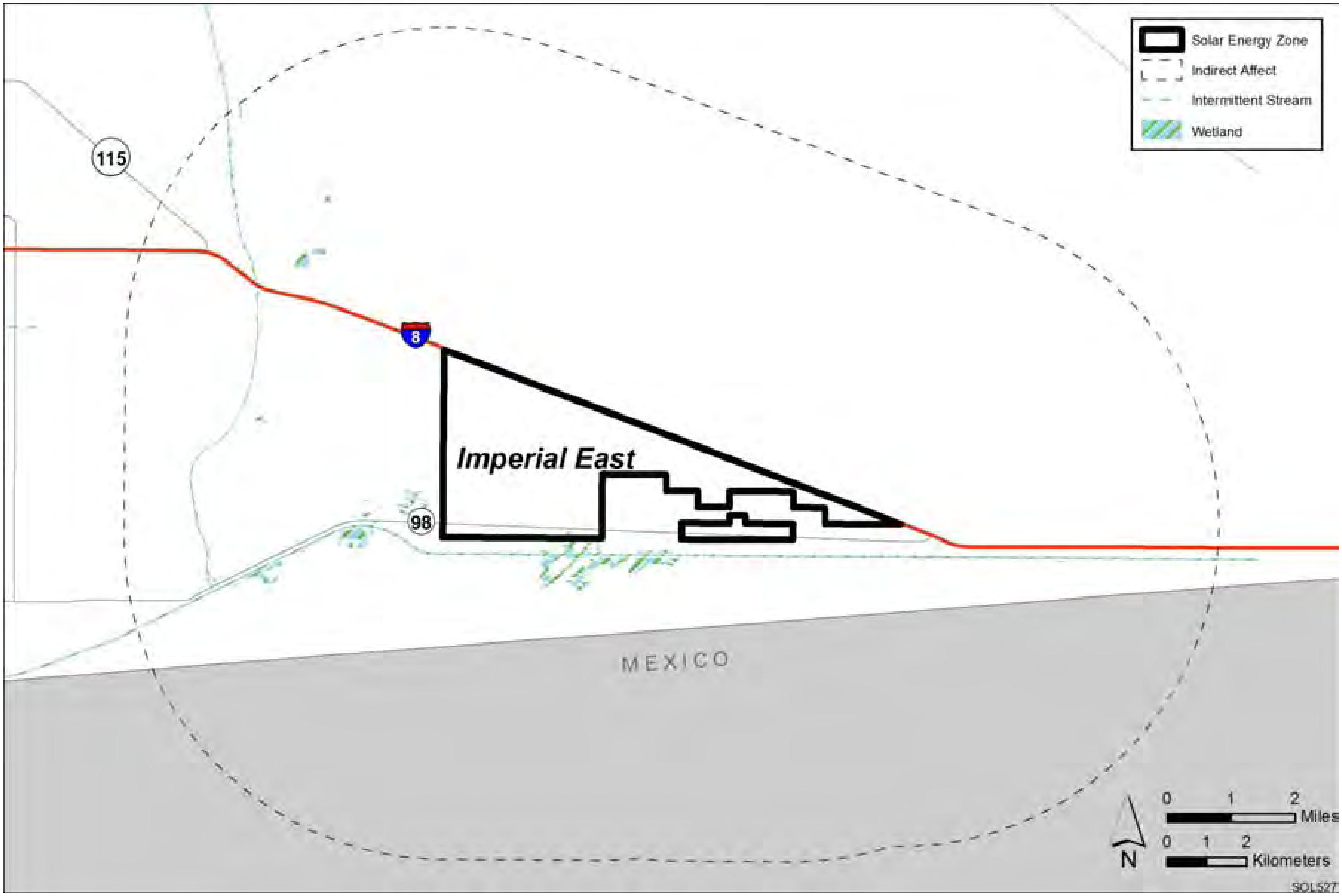

FIGURE 9.1.10.1-2 Wetlands within the Proposed Imperial East SEZ (Source: USFWS 2009)

occurs along the canal. Numerous wetland areas, supported by canal seepage, occur near the canal and range from temporarily to seasonally flooded. They are primarily classified as North American Warm Desert Riparian Woodland and Shrubland. Most of these wetlands are palustrine wetlands with a scrub-shrub plant community. Small areas of emergent plant communities also occur near the canal. Emergent plant communities are composed primarily of herbaceous species rooted in shallow water or saturated soil. Changes in wetland boundaries may occur in some areas subsequent to the lining of portions of the All-American Canal and associated wetland mitigation programs (BOR 2006). Similar wetland types occur to the west of the SEZ and are associated with the East Highline Canal. A number of excavated areas that contain surface water are located northwest of the SEZ. These wetlands are sparsely vegetated and semipermanently to permanently flooded. They are classified as Sonora-Mojave Creosotebush-White Bursage Desert Scrub and as North American Warm Desert Riparian Woodland and Shrubland. One small seasonally flooded wetland in this area supports a scrub-shrub plant community. Wetlands south of the U.S.–Mexico border include the Andrade Mesa wetlands, a system of marshes that are likely supported by seepage from the All-American Canal (University of Arizona 2003).

The proposed Imperial East SEZ is located within the Imperial County Weed Management Area (ICWMA). Table 9.1.10.1-2 provides a list of invasive plant species of the California Sonoran Desert Region, which includes Imperial County. Common reed and tamarisk, which occur in wet areas, occur within the 5-mi (8-km) indirect impact area along the All-American Canal.

9.1.10.2 Impacts

The construction of solar energy facilities within the Imperial East SEZ would result in direct impacts on plant communities because of the removal of vegetation within the facility footprint during land-clearing and land-grading operations. Approximately 80% of the SEZ (4,578 acres [18.5 km^2]) would be expected to be cleared with full development of the SEZ. The plant communities affected would depend on facility locations and could include any of the communities occurring on the SEZ. Therefore, for this analysis, all the area of each cover type within the SEZ is considered to be directly affected by removal with full development of the SEZ.

Indirect effects (e.g., caused by surface runoff or dust from the SEZ) have the potential to degrade affected plant communities and may reduce biodiversity by promoting the decline or elimination of species sensitive to disturbance. Indirect effects can also cause an increase in disturbance-tolerant species or invasive species. High impact levels could result in the elimination of a community or the replacement of one community type for another. The proper implementation of design features, however, would reduce indirect effects to a minor or small level of impact.

Possible impacts from solar energy facilities on vegetation that are encountered within the SEZ, are described in more detail in Section 5.10.1. Any such impacts will be minimized through the implementation of required programmatic design features described in Appendix A,

TABLE 9.1.10.1-2 Weed Species of the California Sonoran Desert Region

Common Name	Scientific Name
Barbwire Russian thistle	*Salsola paulsenii*
Bermudagrass	*Cynodon dactylon*
Camelthorn	*Alhagi maurorum*
Common Russian thistle	*Salsola tragus*
Field bindweed	*Convolvulus arvensis*
Giant reed	*Arundo donax*
Giant salvinia	*Salvinia auriculata*
Hydrilla	*Hydrilla verticillata*
Scarlet wisteria	*Sesbania punicea*
Tamarisk	*Tamarix ramosissima*
Tocalote	*Centaurea melitensis*
White horsenettle	*Solanum elaeagnifolium*

Source: CDFA (2010).

Section A.2.2, and through any additional mitigation applied. SEZ-specific design features are described in Section 9.1.10.3.

9.1.10.2.1 Impacts on Native Species

The impacts of construction, operation, and decommissioning were considered small if the impact affected a relatively small proportion (<1%) of the cover type in the SEZ region (within 50 mi [80 km] of the center of the SEZ); a moderate impact (>1 but <10%) could affect an intermediate proportion of cover type; a large impact could affect greater than 10% of a cover type.

Solar facility construction and operation would primarily affect communities of the Sonora-Mojave Creosotebush-White Bursage Desert Scrub cover type. Additional cover types within the SEZ that would be affected include North American Warm Desert Active and Stabilized Dune; Developed, Open Space–Low Intensity; North American Warm Desert Riparian Woodland and Shrubland; North American Warm Desert Wash; North American Warm Desert Bedrock Cliff and Outcrop; Inter-Mountain Basins Shale Badland; North American Warm Desert Pavement; and North American Warm Desert Volcanic Rockland. The developed areas likely support few native plant communities. The potential impacts on native species cover types resulting from solar energy facilities in the proposed Imperial East SEZ are summarized in Table 9.1.10.1-1. Most of these cover types are relatively common in the SEZ region; however, Inter-Mountain Basins Shale Badland is relatively uncommon, representing approximately 0.3% of the land area within the SEZ region. The construction, operation, and decommissioning of solar projects within the SEZ would result in small impacts on each of the cover types in the affected area.

Re-establishment of shrub communities in temporarily disturbed areas would likely be very difficult because of the arid conditions and might require extended periods of time. In addition, noxious weeds could become established in disturbed areas and colonize adjacent undisturbed habitats, thus reducing restoration success and potentially resulting in widespread habitat degradation.

Potential impacts on wetlands as a result of solar energy facility development are described in Section 5.10.1. Specific to the affected area of the proposed Imperial East SEZ, approximately 5 acres (0.02 km^2) of wetland habitat occurs within the SEZ and could be affected by project development. These wetlands were enhanced to offset impacts from the All-American Canal lining project and are considered a mitigation area.

Grading could result in direct impacts on the wetlands within the SEZ if fill material were placed within wetland areas. Grading near the wetlands in or near the SEZ could disrupt surface water or groundwater flow characteristics, resulting in changes in the frequency, duration, depth, or extent of inundation or soil saturation, and could potentially alter wetland plant communities and affect wetland function. Increases in surface runoff from a solar energy project site could also affect wetland hydrologic characteristics. The introduction of contaminants into wetlands in or near the SEZ could result from spills of fuels or other materials used on a project site. Soil disturbance could result in sedimentation in wetland areas, which could degrade or eliminate wetland plant communities. Sedimentation effects or hydrologic changes could also extend to wetlands outside of the SEZ. Grading could also affect dry washes within the SEZ, and alteration of surface drainage patterns or hydrology could adversely affect downstream dry wash communities. Vegetation within these communities could be lost by erosion or desiccation. See Section 9.1.9 for further discussion of impacts on washes.

Although the use of groundwater within the Imperial East SEZ for technologies with high water requirements, such as wet-cooling systems, may be unlikely, groundwater withdrawals for such systems could affect groundwater resources (see Section 9.1.9.2.2). However, further characterization of the alluvial aquifers of the Imperial Valley groundwater basin would be needed to fully address the impacts of increased groundwater withdrawals for solar energy development. Most of the wetlands in the vicinity of the SEZ are supported by the discharge of shallow groundwater sources, primarily originating from seepage from the All-American Canal and the East Highline Canal. Reductions in groundwater inflows to wetlands that are supported by groundwater discharge could alter wetland hydrologic characteristics and plant communities and could potentially reduce wetland surface area.

The deposition of fugitive dust from disturbed soil areas in habitats outside a solar project area could result in reduced productivity or changes in plant community composition. Fugitive dust deposition could affect plant communities of each of the cover types occurring within the indirect impact area identified in Table 9.1.10.1-1.

9.1.10.2.2 Impacts from Noxious Weeds and Invasive Plant Species

Executive Order (E.O.) 13112, "Invasive Species," directs federal agencies to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts of invasive species (*Federal Register,* Volume 64, page 61836, Feb. 8, 1999). Potential impacts of noxious weeds and invasive plant species resulting from solar energy facilities are described in Section 5.10.1. Despite required design features to prevent the spread of noxious weeds, project disturbance could potentially increase the prevalence of noxious weeds and invasive species in the affected area of the proposed Imperial East SEZ and increase the probability that weeds could be transported into areas that were previously relatively weed free. This could result in reduced restoration success and possible widespread habitat degradation. Noxious weeds, including tamarisk and common reed, occur near the SEZ. Additional species potentially occurring in the Sonoran Desert Region are given in Table 9.1.10.1-2.

Past or present land uses may affect the susceptibility of plant communities to the establishment of noxious weeds and invasive species. Existing roads and recreational OHV use within the SEZ area of potential impact would also likely contribute to the susceptibility of plant communities to the establishment and spread of noxious weeds and invasive species. Portions of the SEZ have been disturbed by the construction of transmission lines. Small areas of Developed, Open Space–Low Intensity, totaling about 230 acres (0.93 km^2), occur within the SEZ, and approximately 1,907 acres (7.72 km^2) occur within the area of indirect effects. Because disturbance may promote the establishment and spread of invasive species, developed areas may provide sources of such species.

9.1.10.3 SEZ-Specific Design Features and Design Feature Effectiveness

In addition to the programmatic design features, SEZ-specific design features would reduce the potential for impacts on plant communities. While the specific practices are best established when project details are considered, some measures can be identified at this time, as follows:

- An Integrated Vegetation Management Plan, addressing invasive species control, and an Ecological Resources Mitigation and Monitoring Plan, addressing habitat restoration, should be approved and implemented to increase the potential for successful restoration of Sonoran Desert habitats, such as desert scrub and dunes, and minimize the potential for the spread of invasive species. Invasive species control should focus on biological and mechanical methods where possible to reduce the use of herbicides.

- Wetland, riparian habitats, desert dry washes which occur primarily within the western and southern portions of the SEZ, and sand dune habitats and sand transport areas, primarily in the northern and eastern portions of the SEZ, should be avoided to the extent practicable, and any impacts minimized and mitigated. A buffer area should be maintained around wetlands, riparian areas, and dry washes to reduce the potential for impacts on wetlands on or near the SEZ. Appropriate engineering controls should be used to minimize impacts on these areas resulting from surface water runoff, erosion, sedimentation, altered hydrology, accidental spills, or fugitive dust deposition to these habitats. Appropriate buffers and engineering controls would be determined through agency consultation.

- An appropriate buffer shall be maintained between project impacts and the wetland south of the Imperial Valley SEZ to ensure all impacts from construction, operations, and maintenance of solar facilities do not impair the current functions and values associated with wetland resource, including habitat support for sensitive species.

- Groundwater withdrawals should be limited to reduce the potential for indirect impacts on wetland habitats associated with groundwater discharge, such as the wetlands near the All-American Canal and East Highline Canal.

If these SEZ-specific design features are implemented in addition to programmatic design features, it is anticipated that a high potential for impacts from invasive species and impacts on wetlands, dry washes, sand dunes, and riparian habitats would be reduced to a minimal potential for impact. Residual impacts on wetlands could result from remaining groundwater withdrawal, etc.; however, it is anticipated that these impacts would be avoided in the majority of instances.

9.1.11 Wildlife and Aquatic Biota

This section addresses wildlife (amphibians, reptiles, birds, and mammals) and aquatic biota that could occur within the potentially affected area of the proposed Imperial East SEZ. Wildlife known to occur within 50 mi (80 km) of the SEZ (i.e., the SEZ region) were determined from the California Wildlife Habitat Relationships System (CDFG 2008). Land cover types suitable for each species were determined from the Southwest Regional Gap Analysis Project (SWReGAP) (USGS 2004, 2005, 2007). The amount of aquatic habitat within the SEZ region was determined by estimating the length of linear perennial stream and canal features and the area of standing water body features (i.e., ponds, lakes, and reservoirs) within 50 mi (80 km) of the SEZ by using available GIS surface water datasets.

The affected area considered in this assessment included the areas of direct and indirect effects. The area of direct effects was defined as the area that would be physically modified during project development (i.e., where ground-disturbing activities would occur within the SEZ). The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary where ground-disturbing activities would not occur but that could be indirectly affected by activities in the area of direct effects (e.g., surface runoff, dust, noise, lighting, and accidental spills from the SEZ). The potential degree of indirect effects would decrease with increasing distance from the SEZ. This area of indirect effects was identified on the basis of professional judgment and was considered sufficiently large to bound the area that would potentially be subject to indirect effects.

The affected area is the area bounded by the areas of direct and indirect effects. These areas are defined and the impact assessment approach is described in Appendix M. No area of direct or indirect effects was assumed for a new transmission line or access road because they are not expected to be needed for facilities on the proposed Imperial East SEZ because of the proximity of an existing transmission line and state highway.

9.1.11.1 Amphibians and Reptiles

9.1.11.1.1 Affected Environment

This section addresses amphibian and reptile species that are known to occur, or for which potentially suitable habitat occurs, on or within the potentially affected area of the proposed Imperial East SEZ. The list of amphibian and reptile species potentially present in the project area was determined from range maps and habitat information available from the California Wildlife Habitat Relationships System (CDFG 2008). Land cover types suitable for each species were determined from the SWReGAP (USGS 2004, 2005, 2007). See Appendix M for additional information on the approach used.

On the basis of the range, habitat preferences, and/or presence of potentially suitable land cover for the amphibian species that occur within southeastern California (CDFG 2008; USGS 2004, 2005, 2007), the red-spotted toad (*Bufo punctatus*) is expected to occur within the proposed Imperial East SEZ. However, because it prefers dry, rocky areas near temporary sources of standing water, its occurrence within the SEZ would be spatially limited. The Couch's spadefoot (*Scaphiopus couchii*) could potentially occur in the SEZ, although its mapped range is east of the SEZ (CDFG 2008). Several other amphibian species could inhabit the All-American Canal, immediately south of the SEZ, and the East Highline Canal, located about 2.8 mi (4.5 km) west of the SEZ. These species include the bullfrog (*Rana catesbeiana*), Colorado River toad (*Bufo alvarius*), Rio Grande leopard frog (*Rana berlandieri*), and Woodhouse's toad (*Bufo woodhousii*). Because these species tend to occur within 300 ft (100 m) of permanent water (USGS 2007), they would not be expected to occur within the SEZ.

Twenty-seven reptile species could occur within the proposed Imperial East SEZ (CDFG 2008): 1 tortoise, 12 lizards, and 14 snakes. The desert tortoise (*Gopherus agassizii*) is a federal- and state-listed threatened species. This species is discussed in Section 9.1.12. Among the more common lizard species that could occur within the SEZ are the Colorado fringe-toed lizard (*Uma notata*), desert horned lizard (*Phrynosoma platyrhinos*), long-nosed leopard lizard (*Gambelia wislizenii*), side-blotched lizard (*Uta stansburiana*), western banded gecko (*Coleonyx variegatus*), and zebra-tailed lizard (*Callisaurus draconoides*).

The most common snake species expected to occur within the proposed Imperial East SEZ are the coachwhip (*Masticophis flagellum*), glossy snake (*Arizona elegans*), gophersnake (*Pituophis catenifer*), groundsnake (*Sonora semiannulata*), and long-nosed snake (*Rhinocheilus lecontei*). The Mojave rattlesnake (*Crotalus scutulatus*) and sidewinder (*C. cerastes*) would be the most common poisonous snake species expected to occur on the SEZ.

Table 9.1.11.1-1 provides habitat information for the representative amphibian and reptile species that could occur on or in the affected area of the proposed Imperial East SEZ.

9.1.11.1.2 Impacts

The potential for impacts on amphibians and reptiles from utility-scale solar energy development within the proposed Imperial East SEZ is presented in this section. The types of impacts that amphibians and reptiles could incur from construction, operation, and decommissioning of utility-scale solar energy facilities are discussed in Section 5.10.2.1. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through any additional mitigation applied. Section 9.1.11.1.3, below, identifies SEZ-specific design features of particular relevance to the Imperial East SEZ.

The assessment of impacts on amphibians and reptile species is based on available information on the presence of species in the affected area as presented in Section 9.1.11.1.1 following the analysis approach described in Appendix M. Additional NEPA assessments and coordination with state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid or mitigate impacts on amphibians and reptiles (see Section 9.1.11.1.3).

TABLE 9.1.11.1-1 Representative Amphibians and Reptiles That Could Occur on or in the Affected Area of the Proposed Imperial East SEZ and Potential Impacts

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Amphibians				
Red-spotted toad (*Bufo punctatus*)	Rocky canyons and gullies in deserts, grasslands, and dry woodlands. When inactive, it occurs under rocks, in rock crevices, or underground. Often found near rocky areas associated with spring seepages, intermittent streams, and cattle tanks. Breeds in shallow water of temporary rain pools, spring-fed pools, and pools along intermittent streams. About 1,065,200 acres[f] of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	35,912 acres of potentially suitable habitat (3.4% of available potentially suitable habitat)	Small
Lizards				
Colorado Desert fringe-toed lizard (*Uma notata*)	Restricted to sparsely vegetated windblown sand of dunes, flats, riverbanks, and washes. Requires fine, loose sand for burrowing. About 190,100 acres of potentially suitable habitat occurs in the SEZ region.	705 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	24,102 acres of potentially suitable habitat (12.7% of available potentially suitable habitat)	Small
Desert horned lizard (*Phrynosoma platyrhinos*)	Deserts dominated by sagebrush, creosotebush, greasewood, or cactus. Occurs on sandy flats, alluvial fans, washes, and edges of dunes. Burrows in soil during periods of inactivity. Common throughout Mojave and Colorado Deserts. About 2,209,200 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	65,422 acres of potentially suitable habitat (3.0% of available potentially suitable habitat)	Small

TABLE 9.1.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a] Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a] Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Lizards (Cont.)				
Long-nosed leopard lizard (*Gambelia wislizenii*)	Desert and semidesert areas with scattered shrubs. Prefers sandy or gravelly flats and plains. Also prefers areas with abundant rodent burrows, which it occupies when inactive. Widely distributed in the Mojave, Colorado, and other desert areas in California. About 1,065,200 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	35,912 acres of potentially suitable habitat (3.4% of available potentially suitable habitat)	Small
Side-blotched lizard (*Uta stansburiana*)	Arid and semiarid locations with scattered bushes or scrubby trees. Often occurs in sandy washes with scattered rocks and bushes. About 1,800,500 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	37,267 acres of potentially suitable habitat (2.1% of available potentially suitable habitat)	Small
Western banded gecko (*Coleonyx variegatus*)	Wide variety of habitats, including deserts with creosotebush and sagebrush and pinyon-juniper woodlands. Inhabits both rocky areas and barren dunes. Most abundant in sandy flats and desert washes. Uses rocks, burrows, and spaces beneath vegetative debris or trash during periods of inactivity. About 1,617,600 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	39,483 acres of potentially suitable habitat (2.4% of available potentially suitable habitat)	Small
Zebra-tailed lizard (*Callisaurus draconoides*)	Sparsely vegetated deserts on open sandy washes, dunes, floodplains, beaches, or desert pavement. Common and widely distributed throughout Mojave and Colorado Deserts. About 1,992,200 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	64,089 acres of potentially suitable habitat (3.2% of available potentially suitable habitat)	Small

TABLE 9.1.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Snakes				
Coachwhip (*Masticophis flagellum*)	Wide variety of open terrain habitats. Most abundant in deserts, grasslands, scrub, chaparral, and pastures. Prefers relatively dry open terrain. Seeks cover in burrows, rocks, or vegetation. About 1,430,200 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	60,553 acres of potentially suitable habitat (4.2% of available potentially suitable habitat)	Small
Glossy snake (*Arizona elegans*)	Variety of habitats including barren to sparsely shrubby deserts, sagebrush flats, grasslands, and sandhills. Prefers sandy areas with scattered brush, but also occurs in rocky areas. Shelters and lays eggs underground. Common throughout southern California, particularly the desert regions. About 1,698,000 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	60,356 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	Small
Gophersnake (*Pituophis catenifer*)	Wide variety of habitats including deserts, prairies, shrublands, woodlands, and farmlands. May dig its burrow or occupy mammal burrows. Eggs are laid in burrows or under large rocks or logs. Most widespread and common snake in California. About 2,016,600 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	65,501 acres of potentially suitable habitat (3.2% of available potentially suitable habitat)	Small
Groundsnake (*Sonora semiannulata*)	Arid and semiarid areas including desert flats, sand hummocks, rocky hillsides with pockets of loose soil. Ranges from prairie and desert lowlands to pinyon-juniper and oak-pine zone. About 1,125,900 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	39,137 acres of potentially suitable habitat (3.5% of available potentially suitable habitat)	Small

TABLE 9.1.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Snakes (Cont.)				
Long-nosed snake (*Rhinocheilus lecontei*)	Typically inhabits deserts, dry prairies, and river valleys. Occurs by day and lays eggs underground or rocks. Burrows rapidly in loose soil. Common in desert regions. About 783,700 acres of potentially suitable habitat occurs in the SEZ region.	783 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	27,671 acres of potentially suitable habitat (3.5% of available potentially suitable habitat)	Small
Mojave rattlesnake (*Crotalus scutulatus*)	Mostly upland desert and lower mountain slopes, including barren desert, grasslands, open woodland, and scrubland. Generally avoids broken rocky terrain or densely vegetated areas. Takes refuge in animal burrows or spaces under or among rocks. Widely distributed throughout the Mojave and extreme northern Colorado Deserts. About 1,125,800 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	39,137 acres of potentially suitable habitat (3.5% of available potentially suitable habitat)	Small
Sidewinder (*Crotalus cerastes*)	Open desert terrain with fine windblown sand, desert flats with sandy washes, or sparsely vegetated sand dunes. Concentrates near washes and areas of relatively dense vegetation where mammal burrows are common. During periods of inactivity, uses underground burrows, occurs under bushes, or almost completely snuggles under sand. Widely distributed and locally abundant in the Mojave and Colorado Deserts. About 1,307,400 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	63,239 acres of potentially suitable habitat (4.8% of available potentially suitable habitat)	Small

Footnotes on next page.

TABLE 9.1.11.1-1 (Cont.)

[a] Maximum area of potentially suitable habitat affected relative to total available potentially suitable habitat within the SEZ region (i.e., a 50-mi [80-km] radius from the center of the SEZ). Only the U.S. portion is tabulated. Habitat availability was determined from potentially suitable land cover for each species (USGS 2004, 2005, 2007).

[b] Direct effects within the SEZ consist of ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations. A maximum of 4,578 acres (18.5 km^2) would be developed in the SEZ.

[c] The area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary. Only the U.S. portion is tabulated. Indirect effects include effects from surface runoff, dust, noise, lighting, etc., from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance from the SEZ boundary.

[d] Overall impact magnitude categories were based on professional judgment and were (1) *small*: ≤1.7% of potentially suitable habitat for the species would be lost and the activity would not result in a measurable change in the carrying capacity or population size in the affected area; (2) *moderate*: >1.7 but ≤17% of potentially suitable habitat for the species would be lost and the activity would potentially result in a measurable but moderate (not destabilizing) change in the carrying capacity or population size in the affected area; and (3) *large*: >17% of potentially suitable habitat for the species would be lost and the activity would result in a potentially large, measurable, and destabilizing change in the carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects, because those effects would be difficult to mitigate. Design features would reduce most indirect effects to negligible levels. Proportion cutoffs were adjusted to account for the fact that 40% of the SEZ region occurs in Mexico.

[e] Species-specific mitigation is presented for those species with particular habitat features that could be readily avoided. For species or individuals occurring outside the SEZ (in the area of indirect effects), no mitigation measures beyond required programmatic design features have been identified.

[f] To convert acres to km^2, multiply by 0.004047.

Sources: CDFG (2008); NatureServe (2010); USGS (2004, 2005, 2007).

In general, impacts on amphibians and reptiles would result from habitat disturbance (i.e., habitat reduction, fragmentation, and alteration) and from disturbance, injury, or mortality to individual amphibians and reptiles. Table 9.1.11.1-1 summarizes the potential impacts on representative amphibian and reptile species resulting from solar energy development that could occur on or in the affected area of the proposed Imperial East SEZ.

On the basis of the impacts on amphibians and reptiles summarized in Table 9.1.11.1-1, direct impacts on amphibian and reptile species would be small, because only 0.1 to 0.4% of potentially suitable habitats identified for the species in the SEZ region would be lost. Larger areas of potentially suitable habitats for the amphibian and reptile species occur within the area of potential indirect effects (e.g., up to 12.7% of available habitat for the Colorado River fringe-toed lizard). Other impacts on amphibians and reptiles could result from surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, accidental spills, collection, and harassment. These indirect impacts are expected to be negligible with implementation of programmatic design features.

Decommissioning of facilities and reclamation of disturbed areas after operations cease could result in short-term negative impacts on individuals and habitats adjacent to project areas, but long-term benefits would accrue if suitable habitats were restored in previously disturbed areas. Section 5.10.2.1.4 provides an overview of the impacts of decommissioning and reclamation on wildlife. Of particular importance for amphibian and reptile species would be the restoration of original ground surface contours, soils, and native plant communities associated with semiarid shrublands.

9.1.11.1.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A, Section A.2.2, would reduce the potential for effects on amphibians and reptiles, especially for those species that utilize habitat types that can be avoided (e.g., palustrine wetlands). Indirect impacts could be reduced to negligible levels by implementing programmatic design features, especially those engineering controls that would reduce runoff, sedimentation, spills, and fugitive dust. While SEZ-specific features are best established when considering specific project details, design features that can be identified at this time include the following:

- The potential for indirect impacts on several amphibian species could be reduced by maximizing the distance between solar energy development and the All-American Canal.

- Avoid wetlands located along the southern boundary of the SEZ, including those that are to be created or enhanced in the area (Section 9.1.9.1.1).

If these SEZ-specific design features are implemented in addition to other programmatic design features, impacts on amphibian and reptile species could be reduced. Any residual impacts on amphibians and reptiles are anticipated to be small given the relative abundance of potentially suitable habitats in the SEZ region. However, as potentially suitable habitats for a number of the amphibian and reptile species occur throughout much of the SEZ, additional species-specific mitigation of direct effects for those species would be difficult or infeasible.

9.1.11.2 Birds

9.1.11.2.1 Affected Environment

This section addresses bird species that are known to occur, or for which potentially suitable habitat occurs, on or within the potentially affected area of the proposed Imperial East SEZ. The list of bird species potentially present in the project area was determined from range maps and habitat information available from the California Wildlife Habitat Relationships System (CDFG 2008). Land cover types suitable for each species were determined from the SWReGAP (USGS 2004, 2005, 2007). See Appendix M for additional information on the approach used.

> **Desert Focal Bird Species**
>
> Bird species whose requirements define spatial attributes, habitat characteristics, and management regimes representative of a healthy desert system (Chase and Geupel 2005).

Nearly 90 species of birds have a range that encompasses the SEZ region. However, habitats for about 40 of these species either do not occur on or are limited within the SEZ (e.g., habitat for waterfowl and wading birds). In addition, the SEZ region is within only the winter range (40 species) or the summer range (9 species) of a number of birds. Eleven bird species that could occur on or in the affected area of the SEZ are considered focal species for the California Partners in Flight's *Desert Bird Conservation Plan* (CalPIF 2009): ash-throated flycatcher (*Myiarchus cinerascens*), black-tailed gnatcatcher (*Polioptila melanura*), black-throated sparrow (*Amphispiza bilineata*), burrowing owl (*Athene cunicularia*), common raven (*Corvus corax*), Costa's hummingbird (*Calypte costae*), crissal thrasher (*Toxostoma crissale*), ladder-backed woodpecker (*Picoides scalaris*), Le Conte's thrasher (*Toxostoma lecontei*), phainopepla (*Phainopepla nitens*), and verdin (*Auriparus flaviceps*). Habitats for these species are described in Table 9.1.11.2-1. The ash-throated flycatcher would be a summer resident within the SEZ, while the other desert focal bird species could occur yearlong (CalPIF 2009).

Waterfowl, Wading Birds, and Shorebirds

As discussed in Section 4.10.2.2.2, waterfowl (ducks, geese, and swans), wading birds (herons and cranes), and shorebirds (avocets, gulls, plovers, rails, sandpipers, stilts, and terns) are among the most abundant groups of birds in the six-state study area. Nearly 20 waterfowl, wading bird, and shorebird species occur within the SEZ region, Within the SEZ, waterfowl, wading birds, and shorebirds are uncommon because of the lack of habitat, but they occur within the area of the All-American Canal just south of the SEZ. The killdeer (*Charadrius vociferus*) and least sandpiper (*Calidris minutilla*) (shorebird species) would be expected to occur on the SEZ. The Colorado River, located more than 20 mi (32 km) east of the SEZ, and the Salton Sea,

TABLE 9.1.11.2-1 Representative Bird Species That Could Occur on or in the Affected Area of the Proposed Imperial East SEZ and Potential Impacts

		Maximum Area of Potential Habitat Affected[a]		
Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Within SEZ (Direct Effects)[b]	Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Shorebirds				
Killdeer (*Charadrius vociferus*)	Widespread throughout California. Open areas such as fields, meadows, lawns, mudflats, and shores. Nests on ground in open dry or gravelly locations. About 317,000 acres[f] of potentially suitable habitat occurs in the SEZ region. Yearlong.	230 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	2,562 acres of potentially suitable habitat (0.8% of available potentially suitable habitat)	Small
Least sandpiper (*Calidris minutilla*)	Wet meadows, mudflats, flooded fields, lake shores, edge of salt marshes, and river sandbars. About 186,600 acres of potentially suitable habitat occurs in the SEZ region. Common to abundant in winter.	44 acres of potentially suitable habitat lost (0.02% of available potentially suitable habitat)	3,870 acres of potentially suitable habitat (2.1% of available potentially suitable habitat)	Small
Neotropical Migrants				
Ash-throated flycatcher (*Myiarchus cinerascens*)	Common in scrub and woodland habitats including desert riparian and desert washes. Requires hole/cavity for nesting. Uses shrubs or small trees for foraging perches. About 1,615,100 acres of potentially suitable habitat occurs in the SEZ region. Summer.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	39,481 acres of potentially suitable habitat (2.4% of available potentially suitable habitat)	Small
Black-tailed gnatcatcher (*Polioptila melanura*)	Nests in bushes mainly in wooded desert washes with dense mesquite, palo verde, ironwood, and acacia. Also occurs in desert scrub habitat. About 1,709,900 acres of potentially suitable habitat occurs in the SEZ region. Yearlong.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	60,356 acres of potentially suitable habitat (3.5% of available potentially suitable habitat)	Small

TABLE 9.1.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Neotropical Migrants (Cont.)				
Black-throated sparrow (*Amphispiza bilineata*)	Chaparral and desert scrub habitats with sparse to open stands of shrubs. Often in areas with scattered Joshua trees. Nests in thorny shrubs or cactus. About 1,429,800 acres of potentially suitable habitat occurs in the SEZ region. Yearlong.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	61,310 acres of potentially suitable habitat (4.3% of available potentially suitable habitat)	Small
Brewer's sparrow (*Spizella breweri*)	Common in Mojave and Colorado Deserts during winter. Occupies open desert scrub and cropland habitats. About 1,172,300 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	40,403 acres of potentially suitable habitat (3.4% of available potentially suitable habitat)	Small
Cactus wren (*Campylorhynchus brunneicapillus*)	Desert (especially areas with cholla cactus or yucca), mesquite, arid scrub, coastal sage scrub, and trees in towns in arid regions. Nests in *Opuntia* spp.; twiggy, thorny trees and shrubs; and sometimes in buildings. Nests may be used as winter roost. Locally common in the Mojave and Colorado Deserts. About 802,100 acres of potentially suitable habitat occurs in the SEZ region. Yearlong.	111 acres of potentially suitable habitat lost (0.01% of available potentially suitable habitat)	4,109 acres of potentially suitable habitat (0.5% of available potentially suitable habitat)	Small
Common poorwill (*Phalaenoptilus nuttallii*)	Scrubby and brushy areas, prairie, desert, rocky canyons, open woodlands, and broken forests. Mostly in arid and semiarid habitats. Nests in open areas on a bare site. About 1,808,500 acres of potentially suitable habitat occurs in the SEZ region. Yearlong.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	40,021 acres of potentially suitable habitat (2.2% of available potentially suitable habitat)	Small

TABLE 9.1.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Neotropical Migrants (Cont.)				
Common raven (*Corvus corax*)	Occurs in most habitats. Trees and cliffs provide cover. Roosts primarily in trees. Nests on cliffs, bluffs, tall trees, or human-made structures. Forages in sparse, open terrain. About 1,355,400 acres of potentially suitable habitat occurs in the SEZ region. Yearlong.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	41,054 acres of potentially suitable habitat (3.0% of available potentially suitable habitat)	Small
Costa's hummingbird (*Calypte costae*)	Desert and semidesert areas, arid brushy foothills, and chaparral. Main habitats are desert washes; edges of desert riparian and valley foothill riparian areas; coastal, desert, and desert succulent shrub; lower elevation chaparral; and palm oasis. Also in mountains, meadows, and gardens during migration and winter. Most common in canyons and washes when nesting. Nests located in trees, shrubs, vines, or cacti. About 1,614,700 acres of potentially suitable habitat occurs in the SEZ region. Common in summer and uncommon in winter in California.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	39,481 acres of potentially suitable habitat (2.4% of available potentially suitable habitat)	Small
Greater roadrunner (*Geococcyx californianus*)	Desert scrub, chaparral, edges of cultivated lands, and arid open areas with scattered brush. Requires thickets, large bushes, or small trees for shade, refuge, and roosting. Usually nests low in trees, shrubs, or clump of cactus. Rarely nests on ground. About 2,114,100 acres of potentially suitable habitat occurs in the SEZ region. Yearlong.	4,578 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	63,599 acres of potentially suitable habitat (3.0% of available potentially suitable habitat)	Small

TABLE 9.1.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a] Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a] Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Neotropical Migrants (Cont.)				
Horned lark (*Eremophila alpestris*)	Common to abundant resident in a variety of open habitats. Breeds in grasslands, sagebrush, semidesert shrublands, and alpine tundra. During migration and winter, inhabits the same habitats other than tundra, and also occurs in agricultural areas. Usually occurs where plant density is low and there are exposed soils. About 1,134,600 acres of potentially suitable habitat occurs in the SEZ region. Yearlong.	4,578 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	35,912 acres of potentially suitable habitat (3.2% of available potentially suitable habitat)	Small
House finch (*Carpodacus mexicanus*)	Variety of areas including arid scrub and brush, desert riparian areas, open woodlands, cultivated lands, and savannas. Usually forages in areas with elevated escape perches (e.g., trees, tall shrubs, transmission lines, and buildings). Roosts and nests in sheltered sites in trees; tall, dense shrubs; man-made structures; cliff crevices; or earthen banks. About 289,800 acres of potentially suitable habitat occurs in the SEZ region. Yearlong.	274 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	5,142 acres of potentially suitable habitat (1.8% of available potentially suitable habitat)	Small
Ladder-backed woodpecker (*Picoides scalaris*)	Fairly common in the Mojave and Colorado Deserts. Variety of habitats including deserts, arid scrub, riparian woodlands, mesquite, scrub oak, pinyon-juniper woodlands. Digs nest hole in rotted stub or dead or dying branches of various trees. Also nests in saguaro, agave, yucca, fence posts, and utility poles. Nests on ledges; branches of trees, shrubs, and cactus; and holes in trees or walls. About 1,146,500 acres of potentially suitable habitat occurs in the SEZ region. Yearlong.	4,578 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	39,138 acres of potentially suitable habitat (3.4% of available potentially suitable habitat)	Small

TABLE 9.1.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Neotropical Migrants (Cont.)				
Le Conte's thrasher (*Toxostoma lecontei*)	Open desert wash, alkali desert scrub, and desert succulent shrub habitats. Prefers to nest and forage in arroyos and washes lined with dense stands of creosotebush and salt bush. About 1,698,700 acres of potentially suitable habitat occurs in the SEZ region. Yearlong but uncommon to rare.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	60,356 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	Small
Lesser nighthawk (*Chordeiles acutipennis*)	Open country, desert regions, scrub, savanna, and cultivated areas. Usually near water including open marshes, salt ponds, large rivers, rice paddies, and beaches. Roosts on low perches or the ground. Nests in the open on bare sites. About 2,128,000 acres of potentially suitable habitat occurs in the SEZ region. Uncommon summer resident.	4,578 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	62,194 acres of potentially suitable habitat (2.9% of available potentially suitable habitat)	Small
Loggerhead shrike (*Lanius ludovicianus*)	Open country with scattered trees and shrubs, savanna, desert scrub, desert riparian, Joshua tree, and occasionally open woodland habitats. Perches on poles, wires, or fence posts (suitable hunting perches are important aspect of habitat). Nests in shrubs and small trees. About 1,802,100 acres of potentially suitable habitat occurs in the SEZ region. Yearlong.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	41,388 acres of potentially suitable habitat (2.3% of available potentially suitable habitat)	Small

TABLE 9.1.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a] Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a] Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Neotropical Migrants (Cont.)				
Phainopepla (*Phainopepla nitens*)	Common in Mojave and Colorado Deserts. Desert scrub, mesquite, juniper and oak woodlands, tall brush, washes, riparian woodlands, and orchards. Nests in dense foliage of large shrubs or trees, sometimes in a clump of mistletoe. About 910,000 acres of potentially suitable habitat occurs in the SEZ region. Yearlong, but many move to more western and northern portions of California during summer.	783 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	27,671 acres of potentially suitable habitat (3.0% of available potentially suitable habitat)	Small
Say's phoebe (*Sayornis saya*)	Arid open country, deserts, sagebrush plains, dry barren foothills, canyons, cliffs, ranches, and rural homes. Nests in cliff crevices, holes in banks, sheltered ledges, tree cavities, under bridges and roofs, and in mines. About 1,392,200 acres of potentially suitable habitat occurs in the SEZ region. Yearlong.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	38,359 acres of potentially suitable habitat (2.8% of available potentially suitable habitat)	Small
Verdin (*Auriparus flaviceps*)	Common to abundant in Colorado Desert, less common in Mojave Desert. Desert riparian, desert wash, desert scrub, and alkali desert scrub areas with large shrubs and small trees. Nests in shrubs, small trees, or cactus. About 1,701,000 acres of potentially suitable habitat occurs in the SEZ region. Yearlong.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	39,480 acres of potentially suitable habitat (2.3% of available potentially suitable habitat)	Small

TABLE 9.1.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Neotropical Migrants (Cont.)				
White-throated swift (*Aeronautes saxatalis*)	Mountainous country near cliffs and canyons where breeding occurs. Forages over forest and open situations. Nests in rock crevices and canyons, sometimes in buildings. Ranges widely over most terrain and habitats, usually high in the air. About 379,200 acres of potentially suitable habitat occurs in the SEZ region. Yearlong.	307 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	5,682 acres of potentially suitable habitat (1.5% of available potentially suitable habitat)	Small
Birds of Prey				
American kestrel (*Falco sparverius*)	Occurs in most open habitats, in various shrub and early successional forest habitats, forest openings, and various ecotones. Perches on trees, snags, rocks, utility poles and wires, and fence posts. Uses cavities in trees, snags, rock areas, banks, and buildings for nesting and cover. About 664,600 acres of potentially suitable habitat occurs in the SEZ region. Yearlong.	307 acres of potentially suitable habitat lost (0.05% of available potentially suitable habitat)	5,714 acres of potentially suitable habitat (0.9% of available potentially suitable habitat)	Small
Golden eagle (*Aquila chrysaetos*)	Grasslands, shrublands, pinyon-juniper woodlands, and ponderosa pine forests. Occasionally in most other habitats, especially during migration and winter. Nests on cliffs and sometimes trees in rugged areas, with breeding birds ranging widely over surrounding areas. About 2,032,000 acres of potentially suitable habitat occurs in the SEZ region. Winter.	4,578 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	40,054 acres of potentially suitable habitat (2.0% of available potentially suitable habitat)	Small

TABLE 9.1.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a] Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a] Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Birds of Prey (Cont.)				
Prairie falcon (*Falco mexicanus*)	Associated primarily with perennial grasslands, savannahs, rangeland, some agricultural fields, and desert scrub areas. Nests in pothole or well-sheltered ledge on rocky cliff or steep earth embankment. May also nest in man-made excavations on otherwise unsuitable cliffs and old nests of ravens, hawks, and eagles. Forages in large patch areas with low vegetation. May forage over irrigated croplands in winter. About 1,901,300 acres of potentially suitable habitat occurs in the SEZ region. Yearlong.	4,578 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	40,020 acres of potentially suitable habitat (2.07% of available potentially suitable habitat)	Small
Red-tailed hawk (*Buteo jamaicensis*)	Wide variety of habitats from deserts, mountains, and populated valleys. Open areas with scattered, elevated perch sites such as scrub desert, plains and montane grassland, agricultural fields, pastures urban parklands, broken coniferous forests, and deciduous woodland. Nests on cliff ledges or in tall trees. About 246,900 acres of potentially suitable habitat occurs in the SEZ region. Yearlong.	230 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	1,908 acres of potentially suitable habitat (0.8% of available potentially suitable habitat)	Small
Turkey vulture (*Cathartes aura*)	Occurs in open stages of most habitats that provide adequate cliffs or large trees for nesting, roosting, and resting. Migrates and forages over most open habitats. Roosts communally in trees, exposed boulders, and occasionally transmission line support towers. About 1,423,300 acres of potentially suitable habitat occurs in the SEZ region. Summer.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	39,678 acres of potentially suitable habitat (2.8% of available potentially suitable habitat)	Small

TABLE 9.1.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a]		Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
		Within SEZ (Direct Effects)[b]	Outside SEZ (Indirect Effects)[c]	
Upland Game Birds				
Gambel's quail (*Callipepla gambelii*)	Deserts, especially in areas with brushy or thorny growth, and adjacent cultivated areas. Usually occurs near water. Nests on the ground under cover of small trees, shrubs, and grass tufts. About 1,902,800 acres of potentially suitable habitat occurs in the SEZ region. Yearlong.	4,578 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	40,494 acres of potentially suitable habitat (2.1% of available potentially suitable habitat)	Small
Mourning dove (*Zenaida macroura*)	Habitat generalist, occurring in grasslands, shrublands, croplands, lowland and foothill riparian forests, ponderosa pine forests, deserts, and urban and suburban areas. Rarely in aspen and other forests, coniferous woodlands, and alpine tundra. Nests on ground or in trees. Winters mostly in lowland riparian forests adjacent to cropland. About 1,846,200 acres of potentially suitable habitat occurs in the SEZ region. Yearlong.	4,578 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	42,192 acres of potentially suitable habitat (2.3% of available potentially suitable habitat)	Small
White-winged dove (*Zenaida asiatica*)	Desert riparian, wash, succulent shrub, scrub, and Joshua tree habitats; orchards and vineyards, croplands, and pastures. About 1,737,700 acres of potentially suitable habitat occurs in the SEZ region. Summer.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	60,357 acres of potentially suitable habitat (3.5% of available potentially suitable habitat)	Small

a Maximum area of potentially suitable habitat affected relative to total available potentially suitable habitat within the SEZ region (i.e., a 50-mi [80-km] radius from the center of the SEZ). Only the U.S. portion is tabulated. Habitat availability was determined from potentially suitable land cover for each species (USGS 2004, 2005, 2007).

b Direct effects within the SEZ consist of ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations. A maximum of 4,578 acres (18.5 km^2) would be developed in the SEZ.

Footnotes continued on next page.

TABLE 9.1.11.2-1 (Cont.)

[c] The area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary. Only the U.S. portion is tabulated. Indirect effects include effects from surface runoff, dust, noise, lighting, etc., from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance from the SEZ boundary.

[d] Overall impact magnitude categories were based on professional judgment and were (1) *small*: ≤1.7% of potentially suitable habitat for the species would be lost and the activity would not result in a measurable change in the carrying capacity or population size in the affected area; (2) *moderate*: >1.7 but ≤17% of potentially suitable habitat for the species would be lost and the activity would potentially result in a measurable but moderate (not destabilizing) change in the carrying capacity or population size in the affected area; and (3) *large*: >17% of potentially suitable habitat for the species would be lost and the activity would result in a potentially large, measurable, and destabilizing change in the carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects, because those effects would be difficult to mitigate. Design features would reduce most indirect effects to negligible levels. Proportion cutoffs were adjusted to account for the fact that 40% of the SEZ region occurs in Mexico.

[e] Species-specific mitigation is presented for those species that have particular habitat features that could be readily avoided. For species or individuals occurring outside the SEZ (in the area of indirect effects), no mitigation measures beyond required programmatic design features have been identified.

[f] To convert acres to km^2, multiply by 0.004047.

Sources: CDFG (2008); NatureServe (2010); USGS (2004, 2005, 2007).

located more than 35 mi (56 km) northwest of the SEZ, would provide more productive habitat for this group of birds.

Neotropical Migrants

As discussed in Section 4.10.2.2.3, neotropical migrants represent the most diverse category of birds within the six-state study area. Neotropical migrants expected to occur on or in the affected area of the proposed Imperial East SEZ throughout the year include the black-tailed gnatcatcher, black-throated sparrow, cactus wren (*Campylorhynchus brunneicapillus*), common poorwill (*Phalaenoptilus nuttallii*), common raven, Costa's hummingbird, crissal thrasher, greater roadrunner (*Geococcyx californianus*), horned lark (*Eremophila alpestris*), house finch (*Carpodacus mexicanus*), ladder-backed woodpecker, Le Conte's thrasher, loggerhead shrike (*Lanius ludovicianus*), phainopepla, Say's phoebe (*Sayornis saya*), verdin, and white-throated swift (*Aeronautes saxatalis*). The winter range for the Brewer's sparrow (*Spizella breweri*), green-tailed towhee (*Pipilo chlorurus*), and sage sparrow (*Amphispiza belli*) encompasses the SEZ, while the summer range for the ash-throated flycatcher (*Myiarchus cinerascens*) and lesser nighthawk (*Chordeiles acutipennis*) encompasses the SEZ (CDFG 2008).

Birds of Prey

Section 4.10.2.2.4 provides an overview of the birds of prey (raptors, owls, and vultures) within the six-state study area. More than 15 birds of prey species have ranges that encompass the proposed Imperial East SEZ (CDFG 2008). Some of these species, particularly several owl and hawk species, are not expected to occur within the SEZ, because their preferred habitats are not present within the SEZ. These species include the long-eared owl (*Asio otus*), northern saw-whet owl (*Aegolius acadicus*), sharp-shinned hawk (*Accipiter striatus*, winter), and western screech-owl (*Megascops kennicottii*). Some raptor species such as the Cooper's hawk (*Accipiter cooperii*), great horned owl (*Bubo virginianus*), merlin (*Falco columbarius*), red-shouldered hawk (*Buteo lineatus*), and rough-legged hawk (*Buteo lagopus*) would either utilize the SEZ occasionally for feeding or would occur only where riparian areas or other woodland habitat occurs.

Raptor species expected to occur within the SEZ include the American kestrel (*Falco sparverius*, yearlong), burrowing owl (yearlong), ferruginous hawk (*Buteo regalis*, winter), golden eagle (*Aquila chrysaetos*, winter), prairie falcon (*Falco mexicanus*, yearlong), red-tailed hawk (*Buteo jamaicensis*, yearlong), and turkey vulture (*Cathartes aura*, summer) (CDFG 2008). However, the American kestrel, golden eagle, prairie falcon, and red-tailed hawk make only infrequent use of the desert regions within which the proposed Imperial East SEZ occurs. The golden eagle is a fully protected species in the State of California (CDFG 2010a).

Upland Game Birds

Section 4.10.2.2.5 provides an overview of the upland game birds (primarily pheasants, grouse, quail, and doves) that occur within the six-state study area. Upland game species that could occur yearlong within the proposed Imperial East SEZ are Gambel's quail (*Callipepla gambelii*) and mourning dove (*Zenaida macroura*), while the white-winged dove (*Zenaida asiatica*) would occur during the summer (CDFG 2008). Gambel's quail is common within the Colorado and Mojave Desert areas of California. It prefers riparian areas and also occurs near streams, springs, and water holes. While it feeds in open habitats, trees or tall shrubs are required for escape cover. It also requires a nearby source of water, particularly during hot summer months (CDFG 2008). Up to 400,000 Gambel's quail are harvested annually in California (CDFG 2008). The mourning dove is common throughout California and can be found in a wide variety of habitats. Regardless of habitat occupied, it requires a nearby water source (CDFG 2008). The white-winged dove occurs in the southeastern corner of California. It inhabits desert riparian, wash, succulent shrub, scrub, alkali scrub, and Joshua tree habitats. It also occurs in orchards, vineyards, cropland, and pastures (CDFG 2008).

Table 9.1.11.2-1 provides habitat information for the representative bird species that could occur on or in the affected area of the proposed Imperial East SEZ. Due to their special status standing, the burrowing owl, crissal thrasher, ferruginous hawk, and short-eared owl are discussed in Section 9.1.12.1.

9.1.11.2.2 Impacts

The types of impacts that birds could incur from construction, operation, and decommissioning of utility-scale solar energy facilities are discussed in Section 5.10.2.1. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through any additional mitigation applied. Section 9.1.11.2.3, below, identifies design features of particular relevance to the proposed Imperial East SEZ.

The assessment of impacts on bird species is based on available information on the presence of species in the affected area as presented in Section 9.1.11.2.1 following the analysis approach described in Appendix M. Additional NEPA assessments and coordination with state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid or mitigate impacts on birds (see Section 9.1.11.2.3).

In general, impacts on birds would result from habitat disturbance (i.e., habitat reduction, fragmentation, and alteration) and from disturbance, injury, or mortality to individual birds. Table 9.1.11.2-1 summarizes the potential impacts on representative bird species resulting from solar energy development that could occur on or in the affected area in the proposed Imperial East SEZ. Direct impacts on bird species would be small for all bird species, because only 0.4% or less of habitats potentially suitable for each species would be lost (Table 9.1.11.2-1). Larger areas of suitable habitat would be lost for bird species that occur within the area of potential indirect effects (e.g., up to 4.3% of potentially suitable habitat for the black-throated sparrow). Other impacts on birds could result from collision with vehicles and buildings, surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, noise, lighting, spread of invasive species, accidental spills, and harassment. Indirect impacts on areas outside the SEZ (e.g., impacts caused by dust generation, erosion, and sedimentation) are expected to be negligible with implementation of programmatic design features.

Decommissioning of facilities and reclamation of disturbed areas after operations cease could result in short-term negative impacts on individuals and habitats adjacent to project areas, but long-term benefits would accrue if suitable habitats were restored in previously disturbed areas. Section 5.10.2.1.4 provides an overview of the impacts of decommissioning and reclamation on wildlife. Of particular importance for bird species would be the restoration of original ground surface contours, soils, and native plant communities associated with semiarid shrublands.

9.1.11.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

The successful implementation of programmatic design features presented in Appendix A, Section A.2.2, would reduce the potential for effects on birds. Indirect impacts could be reduced to negligible levels by implementing programmatic design features, especially those engineering controls that would reduce runoff, sedimentation, spills, and fugitive dust. While SEZ-specific design features important to reducing impacts on birds are best established when specific project details are considered, some design features can be identified at this time, as follows:

- Pre-disturbance surveys should be conducted within the SEZ for bird species listed under the Migratory Bird Treaty Act. Impacts on potential nesting habitat of these species should be avoided, particularly during the nesting season.

- Pre-disturbance surveys should be conducted within the SEZ for the following desert bird focal species (CalPIF 2009): ash-throated flycatcher, black-tailed gnatcatcher, black-throated sparrow, burrowing owl, common raven, Costa’s hummingbird, crissal thrasher, ladder-backed woodpecker, Le Conte’s thrasher, phainopepla, and verdin. Impacts on potential nesting habitat of these species should be avoided.

- Plant species that positively influence the presence and abundance of desert bird focal species should be avoided to the extent practicable. These species include Goodding’s willow, yucca, Joshua tree, mesquite, honey mesquite, screwbean, desert mistletoe, big saltbush, smoketree, and catclaw acacia (CalPIF 2009).

- Wetland habitats along the southern boundary of the SEZ boundary should be avoided to the extent practicable.

- Take of golden eagles and other raptors should be avoided. Mitigation regarding the golden eagle should be developed in consultation with the USFWS and CDFG. A permit may be required under the Bald and Golden Eagle Protection Act.

If these SEZ-specific design features are implemented in addition to programmatic design features, impacts on bird species could be reduced. Any residual impacts on birds are anticipated to be small given the relative abundance of suitable habitats in the SEZ region. However, as potentially suitable habitats for a number of the bird species occur throughout much of the SEZ, additional species-specific mitigation of direct effects for those species would be difficult or infeasible. The potential for indirect impacts on several bird species (particularly waterfowl, wading birds, and shorebirds) could be reduced by maximizing the distance between solar energy facilities and the All-American Canal.

9.1.11.3 Mammals

9.1.11.3.1 Affected Environment

This section addresses mammal species that are known to occur, or for which suitable habitat occurs, on or within the potentially affected area of the proposed Imperial East SEZ. The list of mammal species potentially present in the project area was determined from range maps and habitat information available from the California Wildlife Habitat Relationships System (CDFG 2008). Land cover types suitable for each species were determined from the SWReGAP (USGS 2004, 2005, 2007). See Appendix M for additional information on the approach used. Based on species distributions and habitat preferences, about 40 mammal species could occur within the SEZ (CDFG 2008). The following discussion emphasizes big game and other mammal species that (1) have key habitats within or near the Imperial East SEZ, (2) are important to humans (e.g., big game, small game, and furbearer species), and/or (3) are representative of other species with similar habitats.

Big Game

The desert bighorn sheep (*Ovis canadensis nelsoni*) and mule deer (*Odocoileus hemionus*) are the only big game species expected to occur in the area of the proposed Imperial East SEZ. Because it is a BLM sensitive species, the desert bighorn sheep is discussed in Section 9.1.12. The mule deer is common to abundant throughout California, except in deserts and intensely farmed areas (CDFG 2008). It prefers a mosaic of vegetation that has herbaceous openings, dense brush or tree thickets, riparian areas, and abundant edges. Mule deer are browsers and grazers, feeding on shrubs, forbs, and a few grasses. Brush is important for escape cover and for thermal regulation in winter and summer (CDFG 2008). The burro deer (*Odocoileus hemionus eremicus*), a subspecies of mule deer, occurs in the Colorado Desert. It occurs primarily along the Colorado River, especially during hot summers, and in desert wash woodland communities when away from the river (generally when late summer thunderstorms and cooler temperatures allow the deer to move up the larger washes into the mountains or wash complexes in the foothills) (BLM and CDFG 2002). Burro deer consume foliage from riparian and woodland trees (e.g., willow, palo verde, and ironwood) and various shrubs. Major threats to the burro deer include habitat loss from agricultural development and urbanization and infestation of tamarisk along the Colorado River (BLM and CDFG 2002).

Other Mammals

A number of small game and furbearer species occur within the area of the proposed Imperial East SEZ. These include the American badger (*Taxidea taxus*), black-tailed jackrabbit (*Lepus californicus*), bobcat (*Lynx rufus*), coyote (*Canis latrans*), desert cottontail (*Sylvilagus audubonii*), round-tailed ground squirrel (*Spermophilus tereticaudus*), and white-tailed antelope squirrel (*Ammospermophilus leucurus*) (CDFG 2008).

Nongame (small) mammal species such as bats, mice, kangaroo rats, and shrews also occur within the area of the Imperial East SEZ. These include the cactus mouse (*Peromyscus eremicus*), canyon deermouse (*P. crinitus*), desert kangaroo rat (*Dipodomys deserti*), desert shrew (*Notiosorex crawfordi*), desert woodrat (*Neotoma lepida*), little pocket mouse (*Perognathus longimembris*), long-tailed pocket mouse (*Chaetodipus formosus*), Merriam's kangaroo rat (*Dipodomys merriami*), and southern grasshopper mouse (*Onychomys torridus*) (CDFG 2008). The ranges of nine bat species encompass the SEZ: big brown bat (*Eptesicus fuscus*), Brazilian free-tailed bat (*Tadarida brasiliensis*), Californian leaf-nosed bat (*Macrotus californicus*), California mastiff bat (*Eumops perotis californicus*), California myotis (*Myotis californicus*), pallid bat (*Antrozous pallidus*), spotted bat (*Euderma maculatum*), Townsend's big-eared bat (*Corynorhinus townsendii*), and western pipistrelle (*Parastrellus hesperus*). Most bat species would utilize only the SEZ during foraging. Roost sites for the species (e.g., caves, hollow trees, rock crevices, or buildings) are absent to scarce on or in the affected area of the SEZ.

Table 9.1.11.3-1 provides habitat information for the representative mammal species that could occur on or in the affected area of the proposed Imperial East SEZ. Because of their special status standing, the California mastiff bat, Californian leaf-nose bat, pallid bat, and Townsend's big-eared bat are discussed in Section 9.1.12.1.

9.1.11.3.2 Impacts

The types of impacts that mammals could incur from construction, operation, and decommissioning of utility-scale solar energy facilities are discussed in Section 5.10.2.1. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through any additional mitigation applied. Section 9.1.11.3.3, below, identifies design features of particular relevance to the proposed Imperial East SEZ.

TABLE 9.1.11.3-1 Representative Mammal Species That Could Occur on or in the Affected Area of the Proposed Imperial East SEZ and Potential Impacts

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a] Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a] Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Big Game				
Mule deer (*Odocoileus hemionus*)	Occurs in early to intermediate successional stages of most forest, woodland, and brush habitats. About 1,781,800 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	41,748 acres of potentially suitable habitat (2.3% of available potentially suitable habitat)	Small. Ensure that development does not block free access to the unlined section of the All-American Canal.
Small Game and Furbearers				
American badger (*Taxidea taxus*)	Open grasslands and deserts, meadows in subalpine and montane forests, alpine tundra. Digs burrows in friable soils. Most common in areas with abundant populations of ground squirrels, prairie dogs, and pocket gophers. Relatively uncommon throughout California. About 1,119,200 acres[f] of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	39,137 acres of potentially suitable habitat (3.5% of available potentially suitable habitat)	Small
Black-tailed jackrabbit (*Lepus californicus*)	Open plains, fields, and deserts with scattered thickets or patches of shrubs. Also, open, early stages of forests and chaparral habitats. Rests during the day in shallow depressions, and uses shrubs for cover. About 2,118,900 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	66,029 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	Small

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TABLE 9.1.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Small Game and Furbearers (Cont.)				
Bobcat (*Lynx rufus*)	Occurs in nearly all habitats and successional stages. Optimal habitats include mixed woodlands and forest edges, hardwood forests, swamps, forested river bottoms, brushlands, deserts, mountains, and other areas with thick undergrowth. Availability of water may limit its distribution in xeric regions. Uses rocky clefts, caves, hollow logs, spaces under fallen trees, and so forth when inactive; usually changes shelter areas daily. About 1,613,800 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	42,180 acres of potentially suitable habitat (2.6% of available potentially suitable habitat)	Small
Coyote (*Canis latrans*)	Suitable habitat characterized by interspersions of brush and open areas with free water. Least common in dense coniferous forest. Where human control efforts occur, restricted to broken, rough country with abundant shrub cover and a good supply of rabbits or rodents. About 2,358,200 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	64,112 acres of potentially suitable habitat (2.7% of available potentially suitable habitat)	Small
Desert cottontail (*Sylvilagus audubonii*)	Abundant to common in grasslands, open forests, and desert shrub habitats. Can occur in areas with minimal vegetation as long as adequate cover (e.g., rock piles, fallen logs, fence rows) is present. Thickets and patches of shrubs, vines, and brush also used as cover. About 1,690,200 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	38,161 acres of potentially suitable habitat (2.3% of available potentially suitable habitat)	Small

TABLE 9.1.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Small Game and Furbearers (Cont.)				
Round-tailed ground squirrel (*Spermophilus tereticaudus*)	Optimum habitat includes desert succulent shrub, desert wash, desert scrub, alkali desert scrub, and levees in cropland habitat. Also occurs in urban habitats. Burrows usually at base of shrubs. About 1,146,200 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	39,138 acres of potentially suitable habitat (3.4% of available potentially suitable habitat)	Small
White-tailed antelope squirrel (*Ammospermophilus leucurus*)	Common to abundant in California deserts. Optimal habitats are desert scrub, sagebrush, alkali desert scrub, Joshua tree, bitterbrush, and pinyon-juniper. Fairly common in desert riparian, desert succulent shrub, and desert wash habitats. Also occurs in mixed chaparral and annual grassland habitats. Requires friable soil for burrowing. Burrows may be under shrubs or in open; often uses abandoned kangaroo rat burrows. About 1,709,700 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	36,794 acres of potentially suitable habitat (2.2% of available potentially suitable habitat)	Small
Nongame (Small) Mammals				
Big brown bat (*Eptesicus fuscus*)	Deserts, forests and woodlands, old fields, shrublands, and urban/suburban areas. Uncommon in hot desert habitats. Summer roosts are in buildings, hollow trees, rock crevices, tunnels, and cliff swallow nests. Maternity colonies occur in attics, barns, tree cavities, rock crevices, and caves. Caves, mines, and manmade structures used for hibernation sites. About 1,555,000 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	30,011 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	Small

TABLE 9.1.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a] Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a] Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Nongame (Small) Mammals (Cont.)				
Brazilian free-tailed bat (*Tadarida brasiliensis*)	Cliffs, deserts, grasslands, old fields, savannas, shrublands, woodlands, and suburban/urban areas. Roosts in buildings, caves, and hollow trees. May roost in rock crevices, bridges, signs, or cliff swallow nests during migration. Large maternity colonies inhabit caves, buildings, culverts, and bridges. About 2,194,100 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	66,038 acres of potentially suitable habitat (3.0% of available potentially suitable habitat)	Small
Cactus mouse (*Peromyscus eremicus*)	Deserts, shrublands, chaparral, and coniferous woodlands. Occurs on rocky areas and areas with sandy substrates and loamy soils. Nests in rock heaps, stone walls, burrows, brush fences, and woodrat houses. About 1,626,700 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	39,481 acres of potentially suitable habitat (2.4% of available potentially suitable habitat)	Small
Californian myotis (*Myotis californicus*)	Cliffs, deserts, forests, woodlands, grasslands, savannas, shrublands, and savannas. Often uses manmade structures for night roosts. Uses crevices for summer day roosts. May roost on small desert shrubs or on the ground. Hibernates in caves, mines, tunnels, or buildings. For maternity colonies may inhabit rock crevices, under bark, or under eaves of buildings. Common to abundant below 6,000 ft. About 1,790,000 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	40,020 acres of potentially suitable habitat (2.2% of available potentially suitable habitat)	Small

TABLE 9.1.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a] Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a] Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Nongame (Small) Mammals (Cont.)				
Canyon deermouse (*Peromyscus crinitus*)	Found in most desert and chaparral habitats. Gravelly desert pavement, talus, boulders, cliffs, and slickrock—rocky areas with virtually any type of plant cover. About 1,245,000 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	39,169 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	Small
Desert kangaroo rat (*Dipodomys deserti*)	Low deserts, deep wind-drifted sandy soil with sparse vegetation, alkali sinks, and shadscale or creosotebush scrub. Nests in burrows dug in mounds, usually under vegetation. About 658,700 acres of potentially suitable habitat occurs in the SEZ region.	739 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	24,445 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small
Desert shrew (*Notiosorex crawfordi*)	Generally found in arid areas with adequate cover for nesting and resting. Deserts, semiarid grasslands with scattered cactus and yucca, chaparral slopes, alluvial fans, sagebrush, gullies, juniper woodlands, riparian areas, and dumps. About 2,132,700 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	64,123 acres of potentially suitable habitat (3.0% of available potentially suitable habitat)	Small
Desert woodrat (*Neotoma lepida*)	Sagebrush scrub; chaparral; deserts and rocky slopes with scattered cactus, yucca, pine-juniper, or other low vegetation; creosotebush desert; Joshua tree woodlands; scrub oak woodlands; pinyon-juniper woodlands; and riparian zones. Most abundant in rocky areas with Joshua trees. Dens built of debris on ground, among cacti or yucca, along cliffs, among rocks, or occasionally in trees. About 2,017,000 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	41,318 acres of potentially suitable habitat (2.0% of available potentially suitable habitat)	Small

TABLE 9.1.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Nongame (Small) Mammals (Cont.)				
Little pocket mouse (*Perognathus longimembris*)	Common to abundant in southern California deserts. Preferred habitat includes desert riparian, desert scrub, desert wash, and sagebrush. Nests in an underground burrow. Sandy soil preferred for burrowing, but also commonly burrows on gravel washes and on stony soils. About 1,723,800 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	60,357 acres of potentially suitable habitat (3.5% of available potentially suitable habitat)	Small
Long-tailed pocket mouse (*Chaetodipus formosus*)	Common in sagebrush, desert scrub, and desert succulent shrub habitats with rocky or stony groundcover. Often inhabits rocky washes and canyon mouths. Uses underground burrows. About 1,836,700 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	36,826 acres of potentially suitable habitat (2.0% of available potentially suitable habitat)	Small
Merriam's kangaroo rat (*Dipodomys merriami*)	Most widespread kangaroo rat in California. In southern Califorbnia, occurs in desert scrub and alkali desert scrub, sagebrush, Joshua tree, and pinyon-juniper habitats. Uses desert flats or slopes with sparse to moderate canopy coverage and sandy to gravelly subsrates. Uses underground burrows often located at the base of a shrub. About 1,817,200 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	60,830 acres of potentially suitable habitat (3.3% of available potentially suitable habitat)	Small

TABLE 9.1.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Nongame (Small) Mammals (Cont.)				
Southern grasshopper mouse (*Onychomys torridus*)	Hot, arid valleys and scrub deserts with sparse and scattered vegetation such as mesquite, creosotebush cholla, yucca, and short grasses. Frequents scrub habitats with friable soils for digging. Also uses abandoned underground burrows. About 1,815,000 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	63,583 acres of potentially suitable habitat (3.5% of available potentially suitable habitat)	Small
Spotted bat (*Euderma maculatum*)	Mostly found in the foothills, mountains, and desert regions of southern California. Roosts in caves and cracks or crevices in cliffs and canyons. About 1,765,000 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	40,020 acres of potentially suitable habitat (2.3% of available potentially suitable habitat)	Small
Western pipistrelle (*Parastrellus hesperus*)	Deserts and lowlands, desert mountain ranges, desert scrub flats, and rocky canyons. Roosts mostly in rock crevices, sometimes mines and caves, and rarely in buildings. Suitable roosts occur in rocky canyons and cliffs. Most abundant bat in desert regions. About 1,342,900 acres of potentially suitable habitat occurs in the SEZ region.	4,578 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	38,367 acres of potentially suitable habitat (2.9% of available potentially suitable habitat)	Small

a Maximum area of potentially suitable habitat affected relative to total available potentially suitable habitat within the SEZ region (i.e., a 50-mi [80-km] radius from the center of the SEZ). Only the U.S. portion is tabulated. Habitat availability was determined from potentially suitable land cover for each species (USGS 2004, 2005, 2007).

b Direct effects within the SEZ consist of ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations. A maximum of 4,578 acres (18.5 km^2) would be developed in the SEZ.

Footnotes continued on next page.

TABLE 9.1.11.3-1 (Cont.)

c The area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary. Only the U.S. portion is tabulated. Indirect effects include effects from surface runoff, dust, noise, lighting, etc., from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance from the SEZ boundary.

d Overall impact magnitude categories were based on professional judgment and were (1) *small*: ≤1.7% of potentially suitable habitat for the species would be lost and the activity would not result in a measurable change in the carrying capacity or population size in the affected area; (2) *moderate*: >1.7 but ≤17% of potentially suitable habitat for the species would be lost and the activity would potentially result in a measurable but moderate (not destabilizing) change in the carrying capacity or population size in the affected area; and (3) *large*: >17% of potentially suitable habitat for the species would be lost and the activity would result in a potentially large, measurable, and destabilizing change in the carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects, because those effects would be difficult to mitigate. Design features would reduce most indirect effects to negligible levels. Proportion cutoffs were adjusted to account for the fact that 40% of the SEZ region occurs in Mexico.

e Species-specific mitigation is presented for those species that have particular habitat features that could be readily avoided. For species or individuals occurring outside the SEZ (in the area of indirect effects), no mitigation measures beyond required programmatic design features have been identified.

f To convert acres to km^2, multiply by 0.004047.

Sources: CDFG (2008); NatureServe (2010); USGS (2004, 2005, 2007).

The assessment of impacts on mammal species is based on available information on the presence of species in the affected area as presented in Section 9.1.11.3.1 following the analysis approach described in Appendix M. Additional NEPA assessments and coordination with state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid or mitigate impacts on mammals (see Section 9.1.11.3.3).

Table 9.1.11.3-1 summarizes the potential impacts on representative mammal species resulting from solar energy development (with the implementation of required programmatic design features) in the proposed Imperial East SEZ.

Direct impacts on small game, furbearers, and nongame (small) mammal species would be small, because 0.4% or less of potentially suitable habitats identified for the species would be lost (Table 9.1.11.3-1). Larger areas of suitable habitat for these species occur within the area of potential indirect effects (e.g., up to 3.7% for the desert kangaroo rat). Other impacts on mammals could result from collision with fences and vehicles, surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, noise, lighting, spread of invasive species, accidental spills, and harassment. These indirect impacts are expected to be negligible with implementation of programmatic design features.

Decommissioning of facilities and reclamation of disturbed areas after operations cease could result in short-term negative impacts on individuals and habitats adjacent to project areas, but long-term benefits would accrue if suitable habitats were restored in previously disturbed areas. Section 5.10.2.1.4 provides an overview of the impacts of decommissioning and reclamation on wildlife. Of particular importance for mammal species would be the restoration of original ground surface contours, soils, and native plant communities associated with semiarid shrublands.

9.1.11.3.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A, Section A.2.2, would reduce the potential for effects on mammals. While some SEZ-specific design features are best established when considering specific project details, one design feature that can be identified at this time is the following:

- Ensure that solar project development does not prevent mule deer free access to the unlined section of the All-American Canal.

If this SEZ-specific design feature is implemented in addition to programmatic design features, impacts on mammal species could be reduced. Any residual impacts on mammals are anticipated to be small given the relative abundance of suitable habitats in the SEZ region. However, as potentially suitable habitats for a number of the mammal species occur throughout much of the SEZ, additional species-specific mitigation of direct effects for those species would be difficult or infeasible.

9.1.11.4 Aquatic Biota

9.1.11.4.1 Affected Environment

This section addresses aquatic habitats and biota that are known to occur on the proposed Imperial East SEZ itself or within an area that could be affected, either directly or indirectly, by activities associated with solar energy development within the SEZ. For the proposed Imperial East SEZ, the area of direct effects was considered to be the entire SEZ area. As discussed in Section 9.1.1.1, a new access road would not be needed because State Route 98, a two-lane highway, passes through the southern edge of the SEZ. In addition, for this analysis, the impacts of construction and operation of transmission lines outside of the SEZ were not assessed, assuming that the existing 115-kV transmission line might be used to connect some new solar facilities to load centers, and that additional project-specific analysis would be done for new transmission construction or line upgrades. The area of potential indirect impacts on aquatic biota from SEZ development was considered to extend up to 5 mi (8 km) beyond the SEZ boundary.

There are no water body or stream features located within the proposed Imperial East SEZ (Figure 9.1.10.1-2). As described in Section 9.1.10, there are approximately 5 acres (0.02 km^2) of palustrine wetlands along the southern edge of the SEZ that are part of a larger wetland area located along the All-American Canal. The NWI classification indicates that these wetlands are temporarily flooded throughout the year primarily through seepage from the canal. The recently completed concrete lining of the canal may have reduced the traditional water source for these wetlands. However, restoration efforts are planned (Section 9.1.9.1.1). Fish communities in these wetlands have not been studied in detail, but the limited collection data available indicate that short-lived, heat- and salt-tolerant species like mosquitofish (*Gambusia affinis*), tilapia (*Tilapia zilli*), and mollies (*Poecilia* spp.) predominate (USFWS 1988). The presence of federally listed pupfish and other native California desert species has not been documented within wetlands associated with the All-American Canal, and in evaluating the canal lining project, the USFWS did not identify impacts on endangered fish as a concern (Section 9.1.12) (BOR 2006).

The area of potential indirect impacts on aquatic biota from SEZ development was considered to extend up to 5 mi (8 km) beyond the SEZ boundary (Figure 9.1.10.1-2). No standing water bodies are present in the area of potential indirect effects. The majority of the palustrine wetlands described above are located along the All-American Canal in the area of indirect effects. The only stream-like features within the area of potential indirect effects are portions of the All-American Canal and the East Highline Canal. A total of approximately 17 mi (27 km) of the All-American Canal is located within the area of potential indirect effects, 7 mi (11 km) of which runs from east to west about 0.25 mi (0.4 km) from the southern boundary of the SEZ. The All-American Canal diverts Colorado River water from the Imperial Dam, which is located approximately 39 mi (63 km) northeast of the proposed SEZ. Twenty-three miles (37 km) of the All-American Canal is lined with concrete to prevent water seepage. The East Highline Canal is a diversion off the All-American Canal and is located approximately 4 mi (6.4 km) west of the Imperial East SEZ. Approximately 8 mi (13 km) of the East Highline Canal is located within the area of potential indirect effects. Chironomidae, Oligochaeta, hydracarina, and corbicula dominated the macroinvertebrate community of the nearby Coachella Canal (USFWS 1988) and presumably similar species would be present in the All-American Canal and East Highline Canal. Both canals support populations of non-native sport fish including striped bass (*Morone saxatilis*), largemouth bass (*Micropterus salmoides*), carp (*Cyprinus carpio*), flathead catfish (*Pylodictis olivaris*), channel catfish (*Ictalurus punctatus*), sunfish (*Lepomis* spp.), and tilapia (*Tilapia* spp.) (USFWS 1988). Both canals are heavily used as recreational fishing areas. Native fish are relatively rare in the lower Colorado River due to overfishing, predation by non-native species, and human alteration of streams and rivers (Mueller and Marsh 2002). There are no records of endangered species native to the Colorado River within the All-American Canal (see Section 9.1.12), and the USFWS found no adverse impacts on endangered fish would occur as a result of lining the canal (BOR 2006), suggesting endangered species and suitable habitat are not present.

Outside of the indirect effects area, but within 50 mi (80 km) of the SEZ, there is approximately 94,721 acres (383 km^2) of lake and reservoir habitat (including reservoirs formed by dams constructed on the Colorado River). Also present within 50 mi (80 km) of the SEZ is approximately 40 mi (64 km) of the Colorado River above Ferguson Lake and 42 mi (67.5 km) below the Imperial Dam. There are approximately 122 mi (196 km) of perennial stream habitat, 114 mi (183 km) of intermittent stream habitat, and a total of 371 mi (597 km) of canal habitat within 50 mi (80 km) of the SEZ. Only canal habitat is present within the area of potential indirect effects and represents approximately 5% of the overall amount of stream and canal habitat available within the overall analysis area.

9.1.11.4.2 Impacts

The types of impacts that could occur to aquatic habitats and biota from development of utility-scale solar energy facilities are discussed in Section 5.10.3.1. Effects particularly relevant to aquatic habitats and communities include water withdrawal and changes in water, sediment, and contaminant inputs associated with runoff.

No permanent water bodies or streams are present within the boundaries of the Imperial East SEZ; therefore, no direct impacts on these features are expected. However, wetlands are present and therefore direct impacts on wetland communities are possible as a result of solar energy development within the SEZ. It is also assumed that the man-made All-American Canal and East Highline Canal and associated palustrine wetlands within 5 mi (8 km) of the SEZ (Figure 9.1.10-2) could be indirectly affected by development and operation of solar energy facilities. Aquatic organisms present in these habitat features could be affected by runoff of water and sediment from the SEZ, especially if ground disturbance occurred along the southern boundary of the SEZ (Section 9.1.9.2.1). However, the aquatic communities in both canals are composed primarily of introduced non-native species and implementation of commonly used engineering practices to control water runoff and sediment deposition into these canal and wetland habitat features would control the potential for impacts on aquatic organisms. Overall, the potential for indirect impacts on aquatic habitats and organisms within the region are small.

Water quality in aquatic habitats could be affected by the introduction of contaminants such as fuels, lubricants, or pesticides/herbicides during site characterization, construction, operation, or decommissioning for a solar energy facility, as identified in Section 5.9.1.2.4. Because of the proximity of the Imperial East SEZ to the All-American Canal and associated wetlands, there is the potential for contaminants from solar energy development activities within the SEZ to affect aquatic biota or habitats within these areas.

In arid environments, reductions in the quantity of water in aquatic habitats are of particular concern. Water quantity in aquatic habitats could also be affected if significant amounts of surface water or groundwater were utilized for power plant cooling water, for washing mirrors, or for other needs. The greatest need for water would occur if technologies employing wet cooling, such as parabolic trough or power tower, were developed at the site; the associated impacts would ultimately depend on the water source used (including groundwater from aquifers at various depths). As discussed in Section 9.1.9.2.2, it seems unlikely that sufficient water for wet cooling could be obtained from the All-American Canal. Obtaining cooling water from other perennial surface water features in the region could affect water levels and, as a consequence, aquatic organisms in those water bodies. Additional details regarding the volume of water required and the types of organisms present in potentially affected water bodies would be required in order to further evaluate the potential for impacts from water withdrawals.

9.1.11.4.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features have been identified. If programmatic design features are implemented and if the utilization of water from groundwater or surface water sources is adequately controlled to maintain sufficient water levels in nearby aquatic habitats, the impacts on aquatic biota and habitats from solar energy development at the Imperial East SEZ would be expected to be small.

9.1.12 Special Status Species (Threatened, Endangered, Sensitive, and Rare Species)

This section addresses special status species that are known to occur, or for which suitable habitat occurs, on or within the potentially affected area of the proposed Imperial East SEZ. Special status species include the following types of species[8]:

- Species listed as threatened or endangered under the Endangered Species Act (ESA);

- Species that are proposed for listing, are under review, or are candidates for listing under the ESA;

- Species that are listed as threatened or endangered under the California Endangered Species Act (CESA), or that are identified as fully protected by the state[9];

- Species that are listed by the BLM as sensitive; and

- Species that have been ranked by the State of California as S1 or S2, or species of concern by the State of California or the USFWS; hereafter referred to as "rare" species.

Special status species known to occur within 50 mi (80 km) of the Imperial East SEZ center (i.e., the SEZ region) were determined from natural heritage records available through NatureServe Explorer (NatureServe 2010), information provided by the California Department of Fish and Game (CDFG 2010a), California Natural Diversity Database (CNDDB) (CDFG 2010d), California Regional Gap Analysis Project (CAReGAP) (Davis et al. 1998, USGS 2010a), and SWReGAP (USGS 2004, 2005, 2007). Information reviewed consisted of county-level occurrences as determined from NatureServe, point and polygon element occurrences as determined from CNDDB, as well as modeled land cover types and predicted suitable habitats for the species within the 50-mi (80-km) region as determined from CAReGAP and SWReGAP. The 50-mi (80-km) SEZ region intersects Imperial and Riverside Counties, California; La Paz and Yuma Counties, Arizona; and northern Mexico. However, the SEZ and affected area occur only in Imperial County, California. See Appendix M for additional information on the approach used to identify species that could be affected by development within the SEZ.

[8] See Section 4.6.4 for definitions of these species categories. Note that some of the categories of species included here do not fit BLM's definition of special status species as defined in BLM Manual 6840 (BLM 2008). These species are included here to ensure broad consideration of species that may be most vulnerable to impacts.

[9] State-listed species are those listed as threatened or endangered under the CESA; California fully protected species are species that receive the strictest take provisions as identified by the CDFG.

9.1.12.1 Affected Environment

The affected area considered in the assessment included the areas of direct and indirect effects. The area of direct effects was defined as the area that would be physically modified during project development (i.e., where ground-disturbing activities would occur). For the Imperial East SEZ, the area of direct effects was limited to the SEZ itself. Due to the proximity of existing infrastructure, the impacts of construction and operation of transmission lines outside of the SEZ are not assessed, assuming that the existing transmission might be used to connect some new solar facilities to load centers, and that additional project-specific analysis would be conducted for new transmission construction or line upgrades. Similarly, the impacts of construction or upgrades to access roads were not assessed for this SEZ due to the proximity of I-8 (see Section 9.1.1.2 for a discussion of development assumptions for this SEZ). The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary where ground-disturbing activities would not occur but that could be indirectly affected by activities in the area of direct effects. Indirect effects considered in the assessment included effects from surface runoff, dust, noise, lighting, and accidental spills from the SEZ, but did not include ground-disturbing activities. The potential magnitude of indirect effects would decrease with increasing distance from the SEZ. This area of indirect effects was identified on the basis of professional judgment and was considered sufficiently large to bound the area that would potentially be subject to indirect effects. The affected area includes both the direct and indirect effects areas.

The primary habitat type in the affected area is Sonora-Mojave creosotebush-white bursage desert scrub (see Section 9.1.10). Potentially unique habitats in the affected area in which special status species may reside include desert dunes and various aquatic and wetland habitats. Aquatic and riparian habitats in the affected area occur within and along the All-American Canal and the East Highline Canal, both of which are operated by the IID for the BOR. Seepage wetlands also have the potential to occur along these canals, which may support riparian, freshwater marsh, and scrub communities (see Section 9.1.9; Figure 9.1.12.1-1). Other wetland habitats may occur in the affected area through the seasonal inundation of agricultural fields.

All special status species that are known to occur within the Imperial East SEZ region (i.e., within 50 mi [80 km] of the center of the SEZ) are listed, with their status, nearest recorded occurrence, and habitats, in Appendix J. Of these species, 35 could occur on or in the affected area, based on recorded occurrences or the presence of potentially suitable habitat in the area. These species, their status, and their habitats are presented in Table 9.1.12.1-1. For many of the species listed in the table, their predicted potential occurrence in the affected area is based only on a general correspondence between mapped CAReGAP land cover types and descriptions of species habitat preferences. This overall approach to identifying species in the affected area probably overestimates the number of species that actually occur in the affected area. For many of the species identified as having potentially suitable habitat in the affected area, the nearest known occurrence is more than 20 mi (32 km) from the SEZ.

On the basis of CNDDB records and information provided by the CDFG and USFWS, six special status species are known to occur within the affected area of the Imperial East SEZ: giant Spanish-needle, sand food, flat-tailed horned lizard, California black rail, Yuma clapper

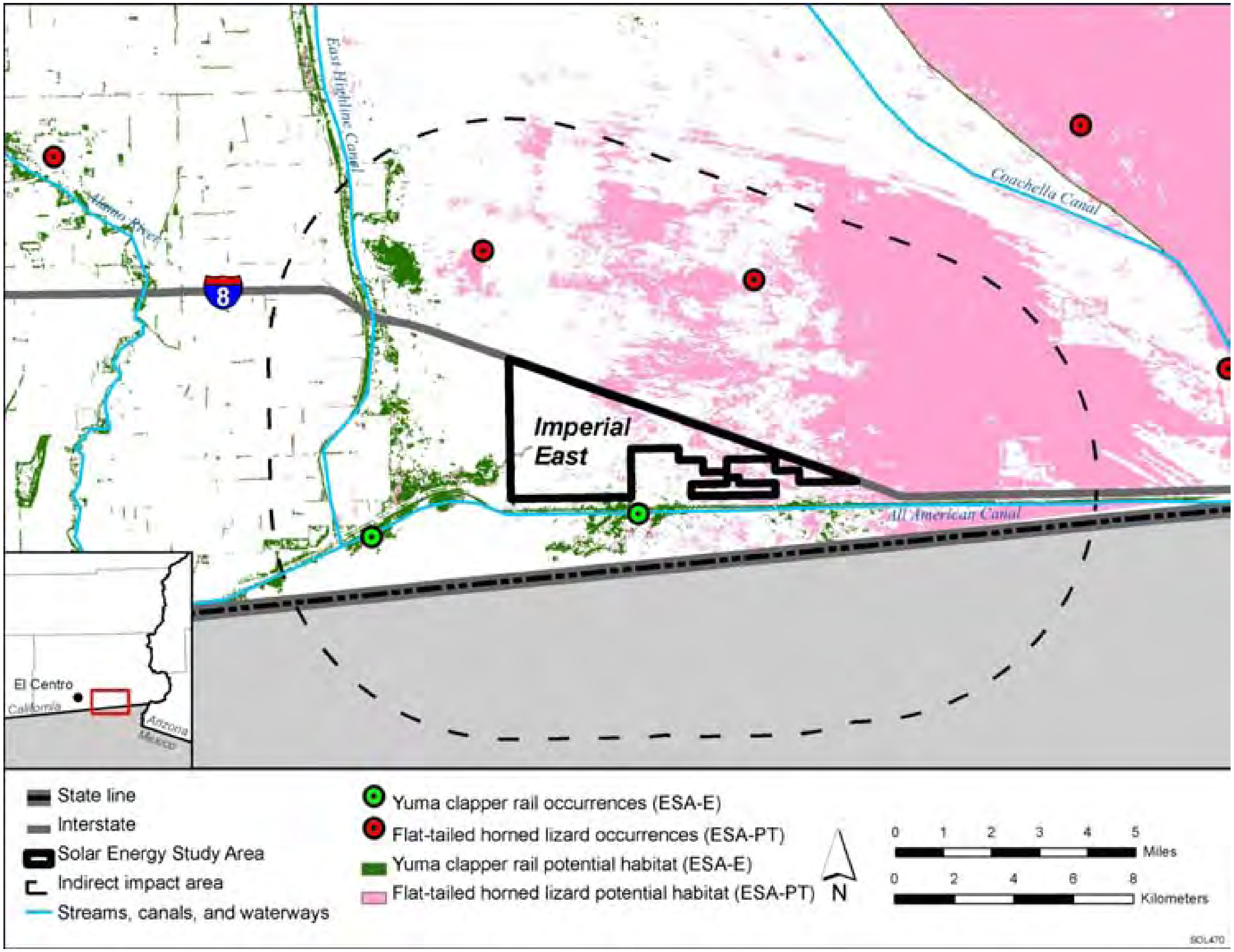

FIGURE 9.1.12.1-1 Known or Potential Occurrences of Species Listed as Endangered, Threatened, or Proposed for Listing under the ESA That May Occur in the Proposed Imperial East SEZ Affected Area (potentially suitable habitat was determined from the CAReGAP land cover model) (Sources: CDFG 2010b; USGS 2010a)

TABLE 9.1.12.1-1 Special Status Habitats, Potential Impacts, and Potential Mitigation for Special Status Species That Could Occur on or in the Affected Area of the Proposed Imperial East SEZ and Potential Impacts

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants						
Abrams' spurge	*Chamaesyce abramsiana*	CA-S1	Restricted to deserts of southern California. Inhabits sandy substrates within creosotebush scrub communities in the Mojave and Sonoran Deserts at elevations below 3,000 ft.[h] Nearest recorded occurrences are 18 mi[i] from the SEZ. About 993,869 acres[j] of potentially suitable habitat occurs within the SEZ region.	4,631 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	35,911 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of desert dunes and sand transport systems could reduce impacts. In addition, pre-disturbance surveys and avoiding or minimizing disturbance of occupied habitats in the areas of direct effect; translocation of individuals from areas of direct effect; or compensatory mitigation of direct effects on occupied habitats could reduce impacts. Note that these same potential mitigations apply to all special status plants.

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TABLE 9.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Bitter hymenoxys	*Hymenoxys odorata*	CA-S2	Sandy substrates within riparian and Sonoran Desert scrub communities. Also occurs within open flats, mesquite flats, ditches, and drainage areas, and along roads and streams. Elevation ranges between 150 and 500 ft. Nearest recorded occurrences are 10 mi from the SEZ. About 1,375,118 acres of potentially suitable habitat occurs within the SEZ region.	4,720 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	39,954 acres of potentially suitable habitat (2.9% of available potentially suitable habitat)	Small overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
Brown turbans	*Malperia tenuis*	CA-S1	Rocky hillsides, alluvium washes, sandy flats, and lava flats within Sonoran Desert scrub and creosotebush scrub communities. Elevation ranges between 50 and 1,100 ft. Nearest recorded occurrences are 31 mi from the SEZ. About 1,526,944 acres of potentially suitable habitat occurs within the SEZ region.	4,665 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	36,255 acres of potentially suitable habitat (2.4% of available potentially suitable habitat)	Small overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.

TABLE 9.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
California satintail	*Imperata brevifolia*	CA-S2	Chaparral, coastal sage scrub, creosotebush, desert scrub, mesic riparian scrub, and alkaline meadow and seep communities. Elevation ranges between 0 and 1,650 ft. Nearest recorded occurrences are 25 mi from the SEZ. About 1,059,507 acres of potentially suitable habitat occurs within the SEZ region.	4,631 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	35,912 acres of potentially suitable habitat (3.4% of available potentially suitable habitat)	Small overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
Chaparral sand-verbena	*Abronia villosa* var. *aurita*	BLM-S; CA-S2	Endemic to southern California. Chaparral desert sand dunes at elevations between 350 and 5,250 ft. Historically occurred on and in the vicinity of the SEZ; the species has not been recorded in the project area since 1964. Most recent recorded occurrences are 15 mi west of the SEZ. About 190,582 acres of potentially suitable habitat occurs within the SEZ region.	705 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	24,102 acres of potentially suitable habitat (12.6% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of desert dunes and sand transport systems could reduce impacts. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.

TABLE 9.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Coves' cassia	*Senna covesii*	CA-S2	Sonoran Desert dry washes and slopes with sandy substrates within desert scrub and creosotebush scrub communities. Elevation ranges between 1,000 and 3,500 ft. Nearest recorded occurrences are 43 mi from the SEZ. About 1,527,612 acres of potentially suitable habitat occurs within the SEZ region.	4,665 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	36,255 acres of potentially suitable habitat (2.4% of available potentially suitable habitat)	Small overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
Dwarf germander	*Teucrium cubense* ssp. *depressum*	CA-S2	Desert dunes, playas, riparian, creosotebush scrub, and desert scrub communities. Elevation ranges between 150 and 1,300 ft. Nearest recorded occurrence is 40 mi from the SEZ. About 1,346,699 acres of potentially suitable habitat occurs within the SEZ region.	5,380 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	63,242 acres of potentially suitable habitat (4.7% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of desert dunes and sand transport systems could reduce impacts. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.

TABLE 9.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Emory's crucifixion-thorn	*Castela emoryi*	CA-S2	Restricted to deserts of southern California and southwestern Arizona, where it occurs at low densities. Inhabits slightly wet areas within Mojave Desert scrub, nonsaline playas, creosotebush scrub, and Sonoran Desert scrub communities. Preferred sites are described as being moist, having fine-textured alluvial bottomland soils, and associated with basalt flows. Elevation ranges between 295 and 2,200 ft. Nearest recorded occurrence is 25 mi from the SEZ. About 1,061,542 acres of potentially suitable habitat occurs within the SEZ region.	4,631 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	35,914 acres of potentially suitable habitat (3.4% of available potentially suitable habitat)	Small overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.

TABLE 9.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Flat-seeded spurge	*Chamaesyce platysperma*	BLM-S; CA-S1	Sandy substrates of desert dunes within Sonoran Desert scrub communities at elevations below 650 ft. Nearest recorded occurrences are 45 mi from the SEZ. About 1,249,216 acres of potentially suitable habitat occurs within the SEZ region.	5,336 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	60,014 acres of potentially suitable habitat (4.8% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of desert dunes and sand transport systems could reduce impacts. Pre-disturbance surveys and avoiding or minimizing disturbance of occupied habitats in the areas of direct effect and off site mitigation, including compensatory mitigation, could reduce impacts. Translocation is not a feasible option for this species.
Giant Spanish-needle[k]	***Palafoxia arida* var. *gigantea***	BLM-S; CA-S1	Desert sand dune habitats at elevations below 330 ft. Known to occur in the affected area within 5 mi east of the SEZ. About 190,187 acres of potentially suitable habitat occurs within the SEZ region.	705 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	24,102 acres of potentially suitable habitat (12.7% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of desert dunes and sand transport systems could reduce impacts. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.

TABLE 9.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Glandular ditaxis	*Ditaxis claryana*	CA-S1	Sandy substrates within desert scrub communities at elevations below 1,525 ft. Nearest recorded occurrence is 20 mi from the SEZ. About 1,059,112 acres of potentially suitable habitat occurs within the SEZ region.	4,631 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	35,912 acres of potentially suitable habitat (3.4% of available potentially suitable habitat)	Small overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
Hairy stickleaf	*Mentzelia hirsutissima*	CA-S2	Patchy distribution in southern California. Washes, fans, or slopes having rocky or sandy substrates within Sonoran Desert scrub and creosotebush scrub communities at elevations below 2,300 ft. Nearest recorded occurrences are 25 mi west of the SEZ. About 1,527,612 acres of potentially suitable habitat occurs within the SEZ region.	4,665 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	36,255 acres of potentially suitable habitat (2.4% of available potentially suitable habitat)	Small overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
Harwood's milkvetch	*Astragalus insularis* var. *harwoodii*	CA-S2	Sonoran Desert of Arizona and California on sandy or gravelly substrates of desert dunes within desert scrub communities. Elevation ranges between 0 and 2,325 ft. Nearest occurrences are approximately 20 mi from the SEZ. About 1,249,216 acres of potentially suitable habitat occurs within the SEZ region.	5,336 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	60,014 acres of potentially suitable habitat (4.8% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance on desert dunes and sand transport systems could reduce impacts. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.

TABLE 9.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Mud nama	*Nama stenocarpum*	CA-S1	Margins of freshwater wetlands in southern California, including lakes, streams, rivers, marshes, and swamps. Elevation ranges between 0 and 1,640 ft. Nearest occurrences are approximately 30 mi from the SEZ. About 94,887 acres of potentially suitable habitat occurs within the SEZ region.	44 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	3,226 acres of potentially suitable habitat (3.4% of available potentially suitable habitat)	Small overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
Munz's cholla	*Opuntia munzii*	BLM-S; CA-S1; FWS-SC	Gravelly or sandy to rocky soils, often on lower bajadas, washes, and flats. Also occurs in hills and canyon sides. Occurs in Sonoran Desert creosotebush shrub communities at elevations below 3,280 ft. Nearest recorded occurrences are 25 mi north (upgradient) of the SEZ. About 1,856,676 acres of potentially suitable habitat occurs within the SEZ region.	4,709 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	37,298 acres of potentially suitable habitat (2.0% of available potentially suitable habitat)	Small overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.

TABLE 9.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Saguaro cactus	*Carnegiea gigantea*	CA-S1	Endemic to the Sonoran Desert along the Colorado River from the Whipple Mountains to Laguna Dam; on rocky substrates within Sonoran Desert scrub and creosote scrub communities at elevations between 160 and 4,900 ft. Nearest recorded occurrence is from the Chuckwalla DWMA, approximately 30 mi northeast of the SEZ. About 1,158,649 acres of potentially suitable habitat occurs within the SEZ region.	4,631 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	35,943 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	Small overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
Sand evening-primrose	*Camissonia arenaria*	CA-S2	Sandy washes and rocky slopes within Sonoran Desert scrub communities at elevations below 3,000 ft. Nearest recorded occurrence is from the Chuckwalla DWMA, approximately 30 mi northeast of the SEZ. About 1,627,232 acres of potentially suitable habitat occurs within the SEZ region.	4,665 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	36,286 acres of potentially suitable habitat (2.2% of available potentially suitable habitat)	Small overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.

TABLE 9.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Sand food	***Pholisma sonorae***	BLM-S; CA-S2; FWS-SC	Sonoran sand dune habitats at elevations below 650 ft. Known to occur in the affected area within 5 mi east of the SEZ. About 190,187 acres of potentially suitable habitat occurs within the SEZ region.	705 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	24,102 acres of potentially suitable habitat (12.7% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of desert dunes and sand transport systems could reduce impacts. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
Slender cottonheads	*Nemacaulis denudata* var. *gracilis*	CA-S2	Mojave and Sonoran Deserts on sandy soils within coastal dunes, desert dunes, creosotebush scrub, and desert scrub communities at elevations below 1,300 ft. Nearest recorded occurrences are 11 mi from the SEZ. About 1,249,299 acres of potentially suitable habitat occurs within the SEZ region.	5,336 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	60,014 acres of potentially suitable habitat (4.8% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of desert dunes and sand transport systems could reduce impacts. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.

TABLE 9.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c] Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c] Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Wiggins' croton	*Croton wigginsii*	CA-S1	Restricted to desert dunes of the Sonoran Desert. Elevation ranges between 164 and 330 ft. Nearest recorded occurrences are from the Algodones Dunes, approximately 11 mi east of the SEZ. About 190,187 acres of potentially suitable habitat occurs within the SEZ region.	705 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	24,102 acres of potentially suitable habitat (12.7% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of desert dunes and sand transport systems could reduce impacts. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
Arthropods						
Cheeseweed owlfly	*Oliarces clara*	CA-S1	Colorado River drainage of southwestern Arizona and southern California within creosotebush scrub communities on or near bajadas at elevations below 330 ft. Nearest recorded occurrences are 30 mi from the SEZ. About 993,869 acres of potentially suitable habitat occurs within the SEZ region.	4,631 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	35,911 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoidance of occupied habitats on the SEZ; or compensatory mitigation of direct effects on occupied habitats could reduce impacts.

TABLE 9.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]		Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
				Within SEZ (Direct Effects)[d]	Outside SEZ (Indirect Effects)[e]	
Reptiles						
Colorado Desert fringe-toed lizard	*Uma notata*	BLM-S; CA-S2	Sparsely vegetated arid areas with windblown sand, including dunes, flats, and washes at elevations below 1,600 ft. Nearest recorded occurrence is 6 mi northeast of the SEZ. About 658,770 acres of potentially suitable habitat occurs within the SEZ region.	739 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	24,445 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of desert dunes and sand transport systems could reduce impacts. in addition, pre-disturbance surveys and avoidance of occupied habitats on the SEZ; translocation of individuals from areas of direct effect; or compensatory mitigation of direct effects could reduce impacts.
Flat-tailed horned lizard	***Phrynosoma mcallii***	ESA-PT; BLM-S; CA-S2; CA-SC	Sandy desert hardpan, gravel flats, and dunes with sparse vegetation of low species diversity at elevations below 850 ft. Known to occur in the affected area within 3 mi north of the SEZ. About 281,300 acres of potentially suitable habitat occurs within the SEZ region.	716 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	24,575 acres of potentially suitable habitat (9.0% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of desert dunes and sand transport systems could reduce impacts. In addition, pre-disturbance surveys and avoidance of occupied habitats on the SEZ or compensatory mitigation of direct effects could reduce impacts.

TABLE 9.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Birds						
California black rail	***Laterallus jamaicensis coturniculus***	BLM-S; CA-FP; CA-T; CA-S1; FWS-SC	Year-round resident in the Imperial Valley and lower Colorado River in Arizona and California. Locally common in marshes along the Colorado River or canal systems. Known to occur in the affected area from the All-American Canal. About 184,792 acres of potentially suitable habitat occurs within the SEZ region.	44 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	3,870 acres of potentially suitable habitat (2.1% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoiding disturbance to occupied and potentially suitable wetland habitats in the area of direct effect could reduce impacts. Translocation and compensatory mitigation are not permitted for California fully protected species. The potential for impact and need for mitigation should be determined in coordination with the USFWS and CDFG.

TABLE 9.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Birds (Cont.)						
Ferruginous hawk	*Buteo regalis*	BLM-S; FWS-SC	Winter resident and migrant at lower elevations and open grasslands, shrublands, and agricultural areas in southern California. Open grasslands, sagebrush flats, desert scrub, desert valleys, and fringes of pinyon-juniper habitats. This species is known to occur in Imperial County, California. About 1,252,826 acres of potentially suitable habitat occurs within the SEZ region.	4,855 acres of potentially suitable foraging habitat lost (0.4% of available potentially suitable habitat)	44,553 acres of potentially suitable foraging habitat (3.6% of available potentially suitable habitat)	Small overall impact on foraging habitat only. Avoidance of all potentially suitable foraging habitat is not feasible because this habitat is widespread in the area of direct effect and readily available throughout the SEZ region.
Least bittern	*Ixobrychus exilis*	BLM-S; CA-S1; CA-SC	Year-round resident in the lower Colorado River Valley including the Salton Sea and the Colorado River in California and Arizona. Emergent vegetation of larger bodies of water such as lakes, ponds, and rivers. Nests in dense cattail marshes and thickets of saltcedar. The species occurs near the Colorado River as near as 35 mi and 40 mi east and northwest of the SEZ, respectively. About 206,149 acres of potentially suitable habitat occurs within the SEZ region.	44 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	3,870 acres of potentially suitable habitat (1.9% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing impacts on wetlands would reduce impacts. Pre-disturbance surveys and avoidance of occupied habitats in the area of direct effect; or compensatory mitigation of direct effects on occupied habitats could reduce impacts.

TABLE 9.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Birds (Cont.)						
Western burrowing owl	*Athene cunicularia hypugaea*	BLM-S; CA-S2; CA-SC	Year-round resident within the SEZ region. Open areas with short sparse vegetation, including grasslands, agricultural fields, and disturbed areas. Nests in burrows created by mammals or tortoises. Feeds on insects and small mammals. Nearest recorded occurrence is 10 mi west of the SEZ. About 2,531,363 acres of potentially suitable habitat occurs within the SEZ region.	5,718 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	76,150 acres of potentially suitable habitat (3.0% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoidance of discovered populations and occupied habitats on the SEZ, or compensatory mitigation of direct effects on occupied habitats could reduce impacts.
White-faced ibis	*Plegadis chihi*	CA-S1; FWS-SC	Winter resident in the lower Colorado River Forages in fresh emergent wetlands, shallow lacustrine waters, muddy ground of wet meadows, and irrigated or flooded pastures and croplands. Dense, fresh emergent wetlands serve as nesting habitat. Roosts amidst dense, freshwater emergent vegetation such as bulrushes, cattails, reeds, or low shrubs over water. Nearest recorded occurrences are from the Salton Sea, approximately 40 mi northwest of the SEZ. About 789,151 acres of potentially suitable habitat occurs within the SEZ region.	44 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	11,372 acres of potentially suitable habitat (1.4% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing impacts on wetlands would reduce impacts. Pre-disturbance surveys and avoidance of occupied habitats in the area of direct effect or compensatory mitigation of direct effects on occupied habitats could reduce impacts.

TABLE 9.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Birds (Cont.)						
Yuma clapper rail	***Rallus longirostris yumanensis***	ESA-E; CA-FP; CA-T; CA-S1	Freshwater marshes containing dense stands of cattails. Nests on dry hummocks or in small shrubs among dense cattails or bulrushes along the edges of shallow ponds in freshwater marshes with stable water levels. Known to occur in the affected area along the All-American Canal within 0.5 mi south of the SEZ. About 185,175 acres of potentially suitable habitat occurs within the SEZ region.	44 acres of potentially suitable habitat lost (<0.1% of available potentially suitable habitat)	3,870 acres of potentially suitable habitat (2.1% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing impacts on wetlands would reduce impacts. Pre-disturbance surveys and avoiding disturbance to occupied and potentially suitable wetland habitats in the area of direct effect also could reduce impacts. Translocation and compensatory mitigation are not permitted for California fully protected species. The potential for impact and need for mitigation should be determined in consultation with the USFWS and CDFG.

TABLE 9.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Mammals						
California leaf-nosed bat	*Macrotus californicus*	BLM-S; CA-S2; CA-SC; FWS-SC	Year-round resident in SEZ region. Desert riparian, desert wash, desert scrub, and palm oasis habitats at elevations below 2,000 ft. Roosts in mines, caves, and buildings. Nearest recorded occurrences are 20 mi east of the SEZ. About 1,539,377 acres of potentially suitable habitat occurs within the SEZ region.	4,698 acres of potentially suitable foraging habitat lost (0.3% of available potentially suitable habitat)	36,795 acres of potentially suitable foraging habitat (2.4% of available potentially suitable habitat)	Small overall impact on foraging habitat only. Avoidance of all potentially suitable foraging habitat is not feasible because this habitat is widespread in the area of direct effect and readily available throughout the SEZ region.
Pallid bat	*Antrozous pallidus*	BLM-S; CA-SC; FWS-SC	Year-round resident throughout the California solar region. Inhabits low-elevation desert communities, including grasslands, shrublands, and woodlands. Day roosts in caves, crevices, and mines. Nearest recorded occurrence is from the North Algodones Dunes Wilderness, approximately 18 mi north of the SEZ. About 1,403,590 acres of potentially suitable habitat occurs within the SEZ region.	4,708 acres of potentially suitable foraging habitat lost (0.3% of available potentially suitable habitat)	39,678 acres of potentially suitable foraging habitat (2.8% of available potentially suitable habitat)	Small overall impact on foraging habitat only. Avoidance of all potentially suitable foraging habitat is not feasible because this habitat is widespread in the area of direct effect and readily available throughout the SEZ region.

TABLE 9.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Mammals (Cont.)						
Pocketed free-tailed bat	*Nyctinomops femorosaccus*	CA-S2; CA-SC; FWS-SC	Arid lowland areas including creosotebush and chaparral habitats in association with very large boulders, high cliffs, rugged rock outcroppings, and rocky canyons. Nearest recorded occurrences are 16 mi from of the SEZ. About 1,120,055 acres of potentially suitable habitat occurs within the SEZ region.	4,631 acres of potentially suitable foraging habitat lost (0.4% of available potentially suitable habitat)	35,912 acres of potentially suitable foraging habitat (3.2% of available potentially suitable habitat)	Small overall impact on foraging habitat only. Avoidance of all potentially suitable foraging habitat is not feasible because this habitat is widespread in the area of direct effect and readily available throughout the SEZ region.
Townsend's big-eared bat	*Corynorhinus townsendii*	BLM-S; CA-S2; CA-SC; FWS-SC	Found throughout California, in all but subalpine and alpine habitats, and may be found at any season throughout its range. Roosts in caves, mines, tunnels, buildings, or other human-made structures. Nearest recorded occurrence is approximately 35 mi from the SEZ. About 2,919,158 acres of potentially suitable habitat occurs within the SEZ region.	5,721 acres of potentially suitable foraging habitat lost (0.2% of available potentially suitable habitat)	75,484 acres of potentially suitable foraging habitat (2.6% of available potentially suitable habitat)	Small overall impact on foraging habitat only. Avoidance of all potentially suitable foraging habitat is not feasible because this habitat is widespread in the area of direct effect and readily available throughout the SEZ region.

TABLE 9.1.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Mammals (Cont.)						
Western mastiff bat	*Eumops perotis californicus*	BLM-S; FWS-SC; CA-SC	Year-round resident in southern California and southwestern Arizona in many open semiarid habitats, including conifer and deciduous woodlands, shrublands, grasslands, chaparral, and urban areas. Day roosts in crevices in cliff faces, buildings, and tall trees. Nearest recorded occurrence is 16 mi west of the SEZ. About 2,435,906 acres of potentially suitable habitat occurs within the SEZ region.	5,721 acres of potentially suitable foraging habitat lost (0.2% of available potentially suitable habitat)	75,484 acres of potentially suitable foraging habitat (3.1% of available potentially suitable habitat)	Small overall impact on foraging habitat only. Avoidance of all potentially suitable foraging habitat is not feasible because this habitat is widespread in the area of direct effect and readily available throughout the SEZ region.
Yuma hispid cotton rat	***Sigmodon hispidus eremicus***	CA-S2; CA-SC; FWS-SC	Southern Colorado River Valley in southwest Arizona and southwestern California in dense stands of vegetation near wetlands, herbaceous grasslands, and hardwood woodland communities. Preferred sites are described as being dense grassy areas such as fields, marshes, and roadside edges, brushy areas along streams or ponds, irrigated fields, and desert scrub. Known to occur in the affected area near the All-American Canal within 0.5 mi south of the SEZ. About 574,906 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	12,554 acres of potentially suitable habitat (2.2% of available potentially suitable habitat)	Small overall impact; no direct effect. Pre-disturbance surveys and avoidance of occupied habitats in the area of direct effect or compensatory mitigation of direct effects on occupied habitats could reduce impacts.

Footnotes on next page.

TABLE 9.1.12.1-1 (Cont.)

[a] BLM-S = listed as a sensitive species by the BLM; CA-S1 = ranked as S1 in the state of California; CA-S2 = ranked as S2 in the state of California; CA-T = listed as threatened by the state of California; ESA-E = listed as endangered under the ESA; ESA-PT = proposed threatened under the ESA; FWS-SC = USFWS species of concern.

[b] For plant and invertebrate species, potentially suitable habitat was determined by using CAReGAP and SWReGAP land cover types. For reptile, bird, and mammal species, potentially suitable habitat was determined by using CAReGAP and SWReGAP habitat suitability models as well as CAReGAP and SWReGAP land cover models. Area of potentially suitable habitat for each species is presented for the SEZ region, which is defined as the area within 50 mi (80 km) of the SEZ center.

[c] Maximum area of potentially suitable habitat that could be affected relative to availability within the SEZ region. Habitat availability for each species within the SEZ region was determined by using CAReGAP and SWReGAP habitat suitability and land cover models. This approach probably overestimates the amount of suitable habitat in the project area. Impacts of access road and transmission line construction, upgrade, or operation are not assessed in this evaluation due to the proximity of existing infrastructure to the SEZ.

[d] Direct effects within the SEZ consist of the ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations.

[e] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary. Indirect effects include effects from surface runoff, dust, noise, lighting, etc., from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance from the SEZ.

[f] Overall impact magnitude categories were based on professional judgment and were (1) *small:* <1% of the population or its habitat would be lost and the activity would not result in a measurable change in carrying capacity or population size in the affected area; (2) *moderate:* ≥1 but <10% of the population or its habitat would be lost and the activity would result in a measurable but moderate (not destabilizing) change in carrying capacity or population size in the affected area; (3) *large:* ≥10% of a population or its habitat would be lost and the activity would result in a large, measurable, and destabilizing change in carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects, because those effects would be difficult to mitigate. Design features would reduce most indirect effects to negligible levels.

[g] Species-specific mitigations are suggested here, but final mitigations should be developed in consultation with state and federal agencies and should be based on pre-disturbance surveys.

[h] To convert ft to m, multiply by 0.3048.

[i] To convert mi to km, multiply by 1.609.

[j] To convert acres to km^2, multiply by 0.004047.

[k] Species in bold text have been recorded or have designated critical habitat in the affected area.

rail, and Yuma hispid cotton rat. There are no groundwater-dependent species in the vicinity of the SEZ based upon CNDDB records, comments provided by the USFWS (Stout 2009), and the evaluation of groundwater resources in the Imperial East SEZ region (Section 9.1.9).

9.1.12.1.1 Species Listed under the ESA That Could Occur in the Affected Area

In its scoping comments on the proposed Imperial East SEZ, the USFWS expressed concern for impacts of project developments on the Yuma clapper rail, a species listed as endangered under the ESA (Stout 2009). The Yuma clapper rail is also listed as threatened under the CESA and is a California fully protected species. This species has the potential to occur on the SEZ or within the affected area on the basis of observed occurrences near the SEZ and the presence of apparently suitable habitat (Figure 9.1.12.1-1; Table 9.1.12.1-1). Appendix J provides basic information on life history, habitat needs, and threats to populations of this species. No other species currently listed under the ESA is likely to occur within the Imperial East SEZ affected area. The USFWS determined that the desert tortoise is absent from the affected area on the basis of the USGS habitat suitability model (Nussear et al. 2009) and known range of the species.

The Yuma clapper rail occurs in freshwater marsh habitats containing dense vegetation such as cattail (*Typha* sp.), bulrush (*Scirpus* sp.), or reeds (*Phragmites* sp.) from southern Nevada, south and west to the Salton Sea, California, and southeast to Arizona and Mexico. According to CNDDB records, the species is known to occur in the affected area of the Imperial East SEZ along the All-American Canal system (Figure 9.1.12.1-1; Table 9.1.12.1-1). The USFWS identified seepage wetland habitats along the canal that could serve as sensitive wetland resources for the species (Stout 2009). In addition, mitigation wetland habitat adjacent to the southern boundary of the SEZ is maintained to offset impacts from previous construction and lining projects for the All-American Canal. According to the CAReGAP land cover model, potentially suitable habitats along the All-American Canal and within associated seepage wetlands are known to occur in the affected area within 0.5 mi (0.8 km) south of the SEZ. Potentially suitable wetland habitat may also occur on the SEZ (Figure 9.1.12.1-1; Table 9.1.12.1-1). A site visit in August 2009 confirmed the presence of potentially suitable habitat along the canal, although no individuals were recorded. Designated critical habitat for this species does not occur in the SEZ region.

9.1.12.1.2 Species Proposed for Listing under the ESA That Could Occur in the Affected Area

The USFWS did not identify any species proposed for listing under the ESA in its scoping comments on the Imperial East SEZ (Stout 2009). However, the flat-tailed horned lizard is proposed for listing as a threatened species under the ESA (USFWS 2010) and is known to occur in the vicinity of the SEZ (Figure 9.1.12.1-1; Table 9.1.12.1-1). Appendix J provides basic information on life history, habitat needs, and threats to populations of this species.

The flat-tailed horned lizard is restricted to desert habitats from Imperial, Riverside, and San Diego Counties, California, and Yuma County, Arizona. It is confined to sandy habitats including dunes, sandy washes, and desert flats. Creosote scrub is the dominant vegetation cover among inhabited locations. Similar to other horned lizards (genus *Phrynosoma*), the flat-tailed horned lizard is an ant specialist, and the distribution of this species is often associated with the occurrence of harvester ants (*Pogonomyrex californicus*). According to CNDDB, the species is known to occur within 3 mi (5 km) north of the Imperial East SEZ. The BLM El Centro Field Office also acknowledged the potential occurrence of this species on BLM-administered lands within the SEZ. Potentially suitable habitat (desert dune and pavement) occurs on the SEZ according to the CAReGAP land cover model and confirmed by a site visit in August 2009 (Figure 9.1.12.1-1; Table 9.1.12.1-1).

9.1.12.1.3 BLM-Designated Sensitive Species

There are 15 BLM-designated sensitive species that may occur in the affected area of the Imperial East SEZ (Table 9.1.12.1-1). These BLM-designated sensitive species include the following: (1) plants—chaparral sand-verbena, flat-seeded spurge, giant Spanish-needle, Munz's cholla, and sand food; (2) reptiles—Colorado Desert fringe-toed lizard and flat-tailed horned lizard; (3) birds—California black rail, ferruginous hawk, least bittern, and western burrowing owl; and (4) mammals—California leaf-nosed bat, pallid bat, Townsend's big-eared bat, and western mastiff bat. Of these species, the giant Spanish-needle and sand food have been recorded in the affected area. Habitats in which these species are found, the amount of potentially suitable habitat in the affected area, and known locations of the species relative to the SEZ are presented in Table 9.1.12.1-1. The flat-tailed horned lizard was previously discussed because it is under review for listing under the ESA (Section 9.1.12.1.2). The remaining 14 BLM-designated sensitive species as related to the SEZ are described in the remainder of this section. Additional life history information for these species is provided in Appendix J.

Chaparral Sand-Verbena

The chaparral sand-verbena is a flowering herb endemic to southern California. It historically occurred approximately 15 mi (24 km) west of the SEZ, but it is currently known to occur only in Riverside and Orange Counties outside the area of indirect effects. Although the species has not been recently recorded near the SEZ, potentially suitable sand dune habitat still occurs on the SEZ and in other portions of the affected area according to the CAReGAP land cover model (Table 9.1.12.1-1).

Flat-Seeded Spurge

The flat-seeded spurge is a flowering herb known only from the Sonoran Desert in southern California and southwestern Arizona. The species inhabits sandy substrates of dunes within desert scrub communities. The species is known to occur as near as 45 mi (72 km) from the SEZ. Populations are not known to occur on the SEZ, but potentially suitable habitat occurs on the SEZ and in other portions of the affected area according to the CAReGAP land cover model (Table 9.1.12.1-1).

Giant Spanish-Needle

The giant Spanish-needle is a flowering herb endemic to sand dune habitats in the Sonoran Desert of southern California and southwestern Arizona. Populations are known to occur as near as 5 mi (8 km) east of the SEZ. Populations are not known to occur on the SEZ, but suitable desert dune habitats may occur on the SEZ and in other portions of the affected area according to the CAReGAP land cover model (Table 9.1.12.1-1).

Munz's Cholla

The Munz's cholla is a tree-like cactus endemic to southern California, where it is known only from the Chocolate Mountains in Imperial and Riverside Counties as near as 25 mi (40 km) north of the SEZ. The species inhabits Sonoran Desert creosotebush scrub communities. It is not known to occur on the SEZ, but potentially suitable habitat occurs on the SEZ and in other portions of the affected area according to the CAReGAP land cover model (Table 9.1.12.1-1).

Sand Food

The sand food is a parasitic plant endemic to Sonoran Desert habitats of southern California and southwestern Arizona. The species lacks chlorophyll and exists as a parasite on the roots of various desert shrubs that inhabit desert dunes. The species is known to occur within 5 mi (8 km) east of the SEZ. Potentially suitable habitat for the species occurs on the SEZ and in other portions of the affected area according to the CAReGAP land cover model (Table 9.1.12.1-1).

Colorado Desert Fringe-Toed Lizard

The Colorado Desert fringe-toed lizard is a fairly small smooth-skinned lizard that inhabits desert sand dune habitats in southeastern California and western Arizona. The species is a habitat specialist, occurring in specialized dune habitats composed of fine, loose, windblown sand deposits. The species is known to occur 6 mi (10 km) northeast of the SEZ. Potentially suitable habitat for the species occurs on the SEZ and in other portions of the affected area according to the CAReGAP land cover model (Table 9.1.12.1-1).

California Black Rail

The California black rail is a small wetland bird that inhabits coastal and freshwater marshes of southern California and western Arizona. This species is also listed as threatened under the CESA and is a California fully protected species. In the SEZ region, the species is associated with marsh habitats containing dense vegetation such as cattail (*Typha* sp.), bulrush (*Scirpus* sp.), or reeds (*Phragmites* sp.). Nearest recorded CNDDB occurrences are 25 mi (40 km) east of the SEZ. However, the USFWS has confirmed the presence of this species in seepage wetland areas associated with the All-American Canal within the affected area (Stout 2009). According to the CAReGAP land cover model, potentially suitable wetland habitats may occur on the SEZ and within other portions of the affected area (Table 9.1.12.1-1).

Ferruginous Hawk

The ferruginous hawk is a winter resident and migrant in the Imperial East SEZ region. The species inhabits open grasslands, sagebrush (*Artemisia* sp.) flats, desert scrub, and the fringes of pinyon-juniper woodlands. This species is known to occur in Imperial County, California, and according to the CAReGAP land cover model, potentially suitable foraging habitat may occur on the SEZ and in other portions of the affected area (Table 9.1.12.1-1).

Least Bittern

The least bittern is a common summer resident in suitable habitats of the lower Colorado River in southwestern California and southwestern Arizona. The species inhabits freshwater marsh habitats containing dense emergent vegetation such as cattail (*Typha* sp.) and reeds (*Phragmites* sp.). Nearest recorded CNDDB occurrences are from the Salton Sea, approximately 35 mi (56 km) northwest of the SEZ. The species may occur in seepage wetlands associated with the All-American Canal, which is located within 0.5 mi (0.8 km) south of the SEZ (Stout 2009). According to the CAReGAP land cover model, potentially suitable foraging and nesting habitats may occur on the SEZ and within other portions of the affected area (Table 9.1.12.1-1).

Western Burrowing Owl

The western burrowing owl is a year-round resident of open, dry grasslands and desert habitats in southern California and Arizona. Populations occur locally in open areas with sparse vegetation. The USFWS has estimated that the Imperial Valley supports the highest western burrowing owl density within North America and over 70% of California's western burrowing owl population. Nearest recorded occurrences are 10 mi (16 km) west of the SEZ. According to the CAReGAP habitat suitability model, potentially suitable habitat may occur on the SEZ and in other portions of the affected area (Table 9.1.12.1-1). The availability of nest sites (burrows) within the affected area has not been determined, shrubland habitat that may be suitable for either foraging or nesting occurs throughout the affected area.

California Leaf-Nosed Bat

The California leaf-nosed bat is a large-eared bat with a leaflike flap of protective skin on the tip of its nose. It primarily occurs along the Colorado River from southern Nevada, through Arizona and California, to Baja California, and Sinaloa Mexico. The species forages in a variety of desert habitats including desert riparian, desert wash, desert scrub, and palm oasis. It roosts in caves, crevices, and mines. Nearest recorded occurrences are 20 mi (32 km) east of the SEZ. According to the CAReGAP land cover model, potentially suitable foraging habitat may occur on the SEZ and in other portions of the affected area (Table 9.1.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no potentially suitable roosting habitat (rocky cliffs and outcrops) in the affected area.

Pallid Bat

The pallid bat is a large pale bat with large ears locally common in desert grasslands and shrublands in the southwestern United States. It roosts in caves, crevices, and mines. The species is a year-round resident throughout southern California. The nearest recorded occurrence is the North Algodones Dunes Wilderness, approximately 18 mi (29 km) north of the SEZ. According to the CAReGAP land cover model, potentially suitable foraging habitat may occur on the SEZ and in other portions of the affected area (Table 9.1.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no potentially suitable roosting habitat (rocky cliffs and outcrops) in the affected area.

Townsend's Big-Eared Bat

The Townsend's big-eared bat is widely distributed throughout the western United States. In California, the species forages year-round in a wide variety of desert and nondesert habitats. The species roosts in caves, mines, tunnels, buildings, and other man-made structures. Nearest recorded occurrences are approximately 35 mi (56 km) from the SEZ. According to the CAReGAP land cover model, potentially suitable foraging habitat may occur on the SEZ and in other portions of the affected area (Table 9.1.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no potentially suitable roosting habitat (rocky cliffs and outcrops) in the affected area.

Western Mastiff Bat

The western mastiff bat is a large uncommon resident of southern California and western Arizona. The species forages in many open, semiarid habitats including conifer and deciduous woodlands, shrublands, grassland, and urban areas. It roosts in crevices, trees, and buildings. Nearest recorded occurrences are 16 mi (26 km) west of the SEZ. According to the CAReGAP land cover model, potentially suitable foraging habitat may occur on the SEZ and in other portions of the affected area (Table 9.1.12.1-1). On the basis of an evaluation of SWReGAP land cover types, there is no potentially suitable roosting habitat (rocky cliffs and outcrops) in the affected area.

9.1.12.1.4 State-Listed Species

There are 2 species listed by the state of California that may occur in the Imperial East SEZ affected area (Table 9.1.12.1-1): California black rail and Yuma clapper rail. Both of these species are listed as a threatened species under the CESA; they are also considered to be California fully protected species. These species were previously discussed in Section 9.1.12.1.1 or Section 9.1.12.1.3 because of their status under the ESA or the BLM.

9.1.12.1.5 Rare Species

There are 35 species that have a state status of S1 or S2 in California or are listed as species of concern by the State of California or USFWS that may occur in the affected area of the Imperial East SEZ (Table 9.1.12.1-1). Of these species, 19 have not been discussed as ESA-listed (Section 9.1.12.1.1), proposed for listing under the ESA (Section 9.1.12.1.2), BLM-designated sensitive (Section 9.1.12.1.3), or state-listed (Section 9.1.12.1.4). The Yuma hispid cotton rat is considered rare in the state of California and is known to occur in the affected area.

9.1.12.2 Impacts

The potential for impacts on special status species from utility-scale solar energy development within the proposed Imperial East SEZ is presented in this section. The types of impacts that special status species could incur from construction and operation of utility-scale solar energy facilities are discussed in Section 5.10.4.

The assessment of impacts on special status species is based on available information on the presence of species in the affected area as presented in Section 9.1.12.1 following the analysis approach described in Appendix M. It is assumed that, prior to development, surveys would be conducted to determine the presence of special status species and their habitats in and near areas where ground-disturbing activities would occur. Additional National Environmental Policy Act of 1969 (NEPA) assessments, ESA consultations, and coordination with state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid, minimize, or mitigate impacts on special status species (see Section 9.1.12.3).

Solar energy development within the Imperial East SEZ could affect a variety of habitats (see Section 9.1.10). These impacts on habitats could in turn affect special status species dependent on those habitats. Based on CNDDB records and information provided by the CDFG and USFWS, there are six special status species known to occur in the affected area: giant Spanish-needle, sand food, flat-tailed horned lizard, California black rail, Yuma clapper rail, and

Yuma hispid cotton rat. These species are listed in bold in Table 9.1.12.1-1. Other special status species may occur on the SEZ or within the affected area based upon the presence of potentially suitable habitat. As discussed in Section 9.1.12.1, this approach to identifying the species that could occur in the affected area probably overestimates the number of species that actually occur in the affected area and may therefore overestimate impacts on some special status species.

Potential direct and indirect impacts on special status species within the SEZ and in the area of indirect effects outside the SEZ are presented in Table 9.1.12.1-1. In addition, the overall potential magnitude of impacts on each species (assuming design features are in place) is presented along with any potential species-specific mitigation measures that could further reduce impacts.

Impacts on special status species could occur during all phases of development (construction, operation, and decommissioning and reclamation) of a utility-scale solar energy project within the SEZ. Construction and operation activities could result in short- or long-term impacts on individuals and their habitats, especially if these activities were sited in areas where special status species are known to or could occur. As presented in Section 9.1.1.2, impacts of access road and transmission line construction, upgrade, or operation are not assessed in this evaluation due to the proximity of existing infrastructure to the SEZ

Direct impacts would result from habitat destruction or modification. It is assumed that direct impacts would occur only within the SEZ where ground-disturbing activities are expected to occur. Indirect impacts could result from surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, accidental spills, harassment, and lighting. No ground-disturbing activities associated with project development are anticipated to occur within the area of indirect effects. Decommissioning of facilities and reclamation of disturbed areas after operations cease could result in short-term negative impacts on individuals and habitats adjacent to project areas, but long-term benefits would accrue if original land contours and native plant communities were restored in previously disturbed areas.

The successful implementation of design features (discussed in Appendix A) would reduce direct impacts on some special status species, especially those that depend on habitat types that can be easily avoided. Indirect impacts on special status species could be reduced to negligible levels by implementing design features, especially those engineering controls that would reduce runoff, sedimentation, spills, and fugitive dust.

9.1.12.2.1 Impacts on Species Listed under the ESA

The Yuma clapper rail is the only species listed under the ESA that has the potential to occur in the affected area of the proposed Imperial East SEZ and the only ESA-listed species that the USFWS identified for its potential to be affected by solar energy development on the SEZ (Stout 2009). The Yuma clapper rail is known to occur in freshwater marsh habitats in southeastern California and southwestern Arizona. Within the Imperial East SEZ region, the species is known to occur along the All-American Canal in Imperial County, California, within 0.5 mi (0.8 km) south of the SEZ (Figure 9.1.12.1-1). According to the CAReGAP land cover model, approximately 44 acres (0.2 km^2) of potentially suitable habitat on the SEZ (desert riparian habitat) could be directly affected by construction and operations of solar energy development on the SEZ (Table 9.1.12.1-1). This direct effects area represents <0.1% of available suitable habitat of the Yuma clapper rail in the SEZ region. About 3,870 acres (16 km^2) of suitable habitat occurs in the area of potential indirect effects; this area represents about 2.1% of the available suitable habitat in the SEZ region (Table 9.1.12.1-1).

The USFWS cautioned that full-scale solar energy development near the southern boundary of the SEZ may directly affect the seepage wetlands associated with the All-American Canal that may provide suitable habitat for this species (Stout 2009). In addition to direct impacts, these wetland habitats may be indirectly affected by fugitive dust, runoff, and sedimentation from solar development on the SEZ.

The overall impact on the Yuma clapper rail from construction, operation, and decommissioning of utility-scale solar energy facilities within the Imperial East SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of design features and complete avoidance of wetland habitats on the SEZ would reduce impacts to negligible levels. Impacts also could be reduced by conducting pre-disturbance surveys and avoiding occupied habitats in the areas of direct effect.

As a California fully protected species (pursuant to the California Fish and Game Code Section 3511), the CDFG has the authority to prohibit impacts on and the taking of Yuma clapper rails under any circumstance. Therefore, direct and indirect impacts on occupied and potentially suitable wetland habitats should be completely avoided. The implementation of design features and complete avoidance of wetland habitats on the SEZ would reduce impacts on this species to negligible levels. Consultation with the USFWS and CDFG would be required under the ESA and CESA to fully address the impacts of solar development on the Yuma clapper rail and to determine any additional mitigation requirements.

9.1.12.2.2 Impacts on Species Proposed for Listing under the ESA

The USFWS did not identify any species proposed for listing under the ESA that might be affected by solar development on the Imperial East SEZ (Stout 2009). However, the flat-tailed horned lizard is proposed for listing as a threatened species under the ESA and is known to occur in the vicinity of the SEZ (Figure 9.1.12.1-1; Table 9.1.12.1-1). This species is restricted to desert habitats from Imperial, Riverside, and San Diego Counties, California, and Yuma County, Arizona. It is primarily confined to sandy habitats including dunes, sandy washes, and desert flats, where there is an abundance of harvester ants (*Pogonomyrex californicus*). According to CNDDB, the species is known to occur within 3 mi (5 km) north of the Imperial East SEZ. The BLM El Centro Field Office also acknowledged the potential occurrence of this species on BLM-administered lands within the SEZ. According to the CAReGAP land cover model, approximately 716 acres (3 km^2) of potentially suitable habitat on the SEZ (desert dune and pavement) could be directly affected by construction and operations of solar energy facilities on the SEZ (Table 9.1.12.1-1). This direct effects area represents about 0.3% of available suitable habitat of the flat-tailed horned lizard in the SEZ region. About 24,575 acres (99 km^2) of suitable habitat occurs in the area of potential indirect effects; this area represents about 9.0% of the available suitable habitat in the SEZ region (Table 9.1.12.1-1).

The overall impact on the flat-tailed horned lizard from construction, operation, and decommissioning of utility-scale solar energy facilities within the Imperial East SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of design features would further reduce indirect impacts to negligible levels.

Avoidance or minimizing disturbance to all occupied or potentially suitable habitat in the area of direct effects could further reduce direct impacts on this species. Potentially suitable habitat on the SEZ that should be avoided include all desert dunes and associated sand transport systems. If avoidance or minimization is not a feasible option, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied or suitable habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. Consultation with the USFWS and CDFG would be required under the ESA and CESA to fully address the impacts of solar development on the flat-tailed horned lizard and to determine mitigation requirements.

9.1.12.2.3 Impacts on BLM-Designated Sensitive Species

Impacts on the 14 BLM-designated sensitive species that have potentially suitable habitat within the SEZ and are not previously discussed as ESA-listed or proposed for ESA listing (Sections 9.1.12.2.1 or 9.1.12.2.2) are discussed below.

Chaparral Sand-Verbena

The chaparral sand-verbena historically occurred as near as 15 mi (24 km) west of the SEZ, but it is currently known to occur only as near as Riverside County, California, outside of the area of indirect effects. According to the CAReGAP land cover model, approximately 705 acres (3 km^2) of potentially suitable desert sand dune habitat within the SEZ may be directly affected by project construction and operations (Table 9.1.12.1-1). This direct effects area represents 0.4% of available suitable habitat in the SEZ region. About 24,102 acres (98 km^2) of potentially suitable habitat occurs within the area of indirect effects; this area represents about 12.6% of the available suitable habitat in the SEZ region (Table 9.1.12.1-1).

The overall impact on the chaparral sand-verbena from construction, operation, and decommissioning of utility-scale solar energy facilities within the Imperial East SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of design features would further reduce indirect impacts to negligible levels.

Chaparral sand-verbena habitat (desert sand dunes) occurs in a limited portion of the SEZ and could be avoided during the development of facilities and protected from indirect effects. Avoiding or minimizing disturbance to occupied habitats and dunes and sand transport systems would further reduce impacts on this species. If avoidance or minimization are not feasible options, plants could be translocated from the area of direct effects to protected areas that would not be affected directly or indirectly by future development. Alternatively, or in combination with translocation, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or more of these options could be designed to completely offset the impacts of development. The need for mitigation, other than design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Flat-Seeded Spurge

The flat-seeded spurge is not known to occur in the affected area of the Imperial East SEZ. According to the CAReGAP land cover model, however, approximately 5,366 acres (22 km^2) of suitable habitat on the SEZ could be directly affected by construction and operations (Table 9.1.12.1-1). This direct effects area represents about 0.4% of available suitable habitat in the SEZ region. About 60,014 acres (243 km^2) of suitable habitat occurs in the area of potential indirect effects; this area represents about 4.8% of the available suitable habitat in the SEZ region (Table 9.1.12.1-1).

The overall impact on the flat-seeded spurge from construction, operation, and decommissioning of utility-scale solar energy facilities within the Imperial East SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of design features would further reduce indirect impacts to negligible levels.

Avoiding and minimizing disturbance of dunes and sand transport systems would reduce impacts on this species. In addition, impacts could be reduced by avoiding or minimizing disturbance to discovered populations and occupied habitats on the SEZ. A compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of protected off site habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that uses one or more of these options could be designed to completely offset the impacts of development. The BLM has determined that translocation is not a feasible mitigation option for this species.

Giant Spanish-Needle

The giant Spanish-needle is known to occur in the affected area of the Imperial East SEZ in desert sand dune habitats. According to the CAReGAP land cover model, approximately

705 acres (3 km^2) of potentially suitable desert dune habitat on the SEZ could be directly affected by construction and operations (Table 9.1.12.1-1). This direct effects area represents 0.4% of available suitable habitat in the SEZ region. About 24,102 acres (98 km^2) of potentially suitable habitat occurs in the area of potential indirect effects; this area represents about 12.7% of the available suitable habitat in the SEZ region (Table 9.1.12.1-1).

The overall impact on the giant Spanish-needle from construction, operation, and decommissioning of utility-scale solar energy facilities within the Imperial East SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of design features would further reduce indirect impacts to negligible levels.

Giant Spanish-needle habitat (desert sand dunes) occupies a limited portion of the SEZ and could be avoided during the development of facilities and protected from indirect effects. Avoiding or minimizing disturbance to occupied habitats and dunes and sand transport systems, and the mitigation measures described previously for the chaparral sand-verbena, could further reduce impacts on this species.

Munz's Cholla

The Munz's cholla is not known to occur in the affected area of the Imperial East SEZ. However, according to the CAReGAP land cover model, approximately 4,709 acres (19 km^2) of potentially suitable desert scrub and wash habitats on the SEZ could be directly affected by construction and operations (Table 9.1.12.1-1). This direct impact area represents about 0.3% of available suitable habitat in the SEZ region. About 37,298 acres (151 km^2) of potentially suitable habitat occurs in the area of potential indirect effects; this area represents about 2.0% of the available suitable habitat in the SEZ region (Table 9.1.12.1-1).

The overall impact on the Munz's cholla from construction, operation, and decommissioning of utility-scale solar energy facilities within the Imperial East SEZ is considered small, because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of design features would further reduce indirect impacts to negligible levels.

The avoidance of all potentially suitable habitats is not a feasible way to mitigate impacts on the Munz's cholla, because these habitats (mostly desert scrub) are widespread throughout the area of direct effects. However, the implementation of mitigation options described previously for the chaparral sand-verbena could reduce impacts on this species.

Sand Food

The sand food is known to occur in the affected area of the Imperial East SEZ in desert sand dune habitats. According to the CAReGAP land cover model, approximately 705 acres (3 km^2) of potentially suitable desert dune habitat on the SEZ could be directly affected by construction and operations (Table 9.1.12.1-1). This direct effects area represents 0.4% of available suitable habitat in the SEZ region. About 24,102 acres (98 km^2) of potentially suitable habitat occurs in the area of potential indirect effects; this area represents about 12.7% of the available suitable habitat in the SEZ region (Table 9.1.12.1-1).

The overall impact on the sand food from construction, operation, and decommissioning of utility-scale solar energy facilities within the Imperial East SEZ is considered small, because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of design features would further reduce indirect impacts to negligible levels.

Sand food habitat (desert sand dunes) occupies a limited portion of the SEZ and could be avoided during the development of facilities and protected from indirect effects. Avoiding or minimizing disturbance to occupied habitats and dunes and sand transport systems, and the mitigation measures described previously for the chaparral sand-verbena, could further reduce impacts on this species.

Colorado Desert Fringe-Toed Lizard

The Colorado Desert fringe-toed lizard is not known to occur in the affected area of the Imperial East SEZ, although nearest occurrences are 6 mi (10 km) northeast of the SEZ. According to the CAReGAP land cover model, approximately 739 acres (3 km^2) of potentially suitable habitat (desert dunes and washes) on the SEZ could be directly affected by construction and operations (Table 9.1.12.1-1). This direct effects area represents about 0.1% of available suitable foraging habitat in the SEZ region. About 24,445 acres (99 km^2) of potentially suitable foraging habitat occurs in the area of potential indirect effects; this area represents about 3.7% of the available suitable habitat in the SEZ region (Table 9.1.12.1-1).

The overall impact on the Colorado Desert fringe-toed lizard from construction, operation, and decommissioning of utility-scale solar energy facilities within the Imperial East SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of design features would further reduce indirect impacts to negligible levels.

Colorado Desert fringe-toed lizard habitat (desert sand dunes and washes) occupies a limited portion of the SEZ and could be avoided during the development of facilities and protected from indirect effects. Avoiding or minimizing disturbance to occupied habitats, dune and sand transport systems, and desert wash habitats would reduce impacts on this species. If avoidance or minimization is not feasible, impacts could be reduced to negligible levels by conducting pre-disturbance surveys and avoiding occupied habitats on the SEZ. A compensatory mitigation plan could also be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that uses a number of mitigation options could be designed to completely offset the impacts of development.

California Black Rail

The California black rail is listed as a BLM-designated sensitive species; it is also listed as threatened under the CESA and is a California fully protected species. This species is associated with freshwater marsh habitats in southern California and southwestern Arizona. According to CNDDB and information provided by the CDFG and USFWS, the species is known to occur in the affected area of the Imperial East SEZ. The USFWS has confirmed the presence of this species in seepage wetland areas associated with the All-American Canal within the affected area. According to the CAReGAP land cover model, approximately 44 acres (0.2 km^2) of potentially suitable habitat on the SEZ (desert riparian habitat) could be directly affected by construction and operations of solar energy facilities on the SEZ (Table 9.1.12.1-1). This direct effects area represents about less than 0.1% of available suitable habitat of the California black rail in the SEZ region. About 3,870 acres (16 km^2) of suitable habitat occurs in the area of potential indirect effects; this area represents about 2.1% of the available suitable habitat in the SEZ region (Table 9.1.12.1-1).

The overall impact on the California black rail from construction, operation, and decommissioning of utility-scale solar energy facilities within the Imperial East SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of design features would further reduce indirect impacts to negligible levels.

As a California fully protected species (pursuant to the California Fish and Game Code Section 3511), the CDFG has the authority to prohibit impacts on and the taking of California black rails under any circumstance. Therefore, direct and indirect impacts on occupied and potentially suitable wetland habitats should be completely avoided. Complete avoidance of wetland habitats on the SEZ would reduce impacts on this species to negligible levels. Consultation with the CDFG should be conducted to fully address the impacts of solar development on the California black rail and to determine any additional mitigation requirements.

Ferruginous Hawk

The ferruginous hawk is a winter resident in southern California within the Imperial East SEZ region. According to the CAReGAP land cover model, approximately 4,855 acres (20 km^2) of potentially suitable foraging habitat on the SEZ could be directly affected by construction and operations (Table 9.1.12.1-1). This direct effects area represents about 0.4% of available suitable habitat in the SEZ region. About 44,553 acres (180 km^2) of potentially suitable habitat occurs in the area of potential indirect effects; this area represents about 3.6% of the available suitable habitat in the SEZ region (Table 9.1.12.1-1).

The overall impact on the ferruginous hawk from construction, operation, and decommissioning of utility-scale solar energy facilities within the Imperial East SEZ is considered small because direct effects would only occur on potentially suitable foraging habitat, and the amount of this habitat in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of impacts on all potentially suitable foraging habitat is not a feasible way to mitigate impacts on the ferruginous hawk because potentially suitable shrubland is widespread throughout the area of direct effects and readily available in other portions of the affected area.

Least Bittern

Within the Imperial East SEZ region, the least bittern is a common summer resident in marsh and wetland habitats from the Salton Sea northwest of the SEZ to the Colorado River east of the SEZ. The species is not known to occur in the affected area of the Imperial East SEZ. However, according to the CAReGAP land cover model, approximately 44 acres (0.2 km^2) of potentially suitable habitat on the SEZ (desert riparian habitat) could be directly affected by construction and operations of solar energy facilities on the SEZ (Table 9.1.12.1-1). This direct effects area represents less than 0.1% of available suitable habitat of the least bittern in the SEZ region. About 3,870 acres (16 km^2) of suitable habitat occurs in the area of potential indirect effects; this area represents about 2.1% of the available suitable habitat in the SEZ region (Table 9.1.12.1-1).

The overall impact on the least bittern from construction, operation, and decommissioning of utility-scale solar energy facilities within the Imperial East SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of design features would further reduce indirect impacts to negligible levels.

Because the least bittern, California black rail, and Yuma clapper rail occupy similar habitats in the SEZ region, mitigation would be similar to offset impacts of solar energy development within the Imperial East SEZ for these three species. Although the least bittern is not a California fully protected species, the strict provisions provided to the California black rail and Yuma clapper rail as fully protected species would also preclude direct and indirect impacts of solar energy development within the Imperial East SEZ to the least bittern.

Western Burrowing Owl

The western burrowing owl is not known to occur in the affected area of the Imperial East SEZ. However, according to the CAReGAP habitat suitability model, approximately 5,718 acres (23 km^2) of potentially suitable desert scrub habitat on the SEZ could be directly affected by construction and operations (Table 9.1.12.1-1). This direct effects area represents less than 0.1% of available suitable habitat in the SEZ region. About 11,372 acres (46 km^2) of potentially suitable habitat occurs in the area of potential indirect effects; this area represents about 3.0% of the available suitable habitat in the SEZ region (Table 9.1.12.1-1). Most of this area could serve as foraging and nesting habitat (shrublands). The abundance of burrows suitable for nesting on the SEZ and in the area of indirect effects has not been determined.

The overall impact on the western burrowing owl from construction, operation, and decommissioning of utility-scale solar energy facilities within the Imperial East SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels.

Avoidance of all potentially suitable habitats is not feasible to mitigate impacts on the western burrowing owl because potentially suitable shrubland habitats are widespread throughout the area of direct effect and readily available in other portions of the SEZ region. However, impacts on the western burrowing owl could be reduced by avoiding or minimizing disturbance to occupied burrows and habitat in the area of direct effects. If avoidance or minimization of disturbance to all occupied habitat is not a feasible option, a compensatory mitigation plan could be developed and implemented to mitigate direct effects. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or both of these options could be designed to completely offset the impacts of development. The need for mitigation, other than design features, should be determined by conducting preconstruction surveys for the species and its habitat within the area of direct effects.

California Leaf-Nosed Bat

The California leaf-nosed bat is a year-round resident in southern California within the Imperial East SEZ region. According to the CAReGAP land cover model, approximately 4,698 acres (19 km^2) of potentially suitable foraging habitat on the SEZ could be directly affected by construction and operations (Table 9.1.12.1-1). This direct effects area represents about 0.3% of available suitable foraging habitat in the SEZ region. About 36,795 acres (149 km^2) of potentially suitable foraging habitat occurs in the area of potential indirect effects; this area represents about 2.4% of the available suitable foraging habitat in the SEZ region (Table 9.1.12.1-1). Most of the potentially suitable habitat in the affected area is foraging habitat represented by desert shrubland. On the basis of an evaluation of CAReGAP land cover types, there is no potentially suitable roosting habitat (rocky cliffs and outcrops) in the affected area.

The overall impact on the California leaf-nosed bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the Imperial East SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable foraging habitat in the SEZ region. The implementation of design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of all potentially suitable foraging habitats is not feasible because potentially suitable habitat is widespread throughout the area of direct effect and readily available in other portions of the SEZ region.

Pallid Bat

The pallid bat is a year-round resident in southern California within the Imperial East SEZ region. According to the CAReGAP land cover model, approximately 4,708 acres (19 km^2) of potentially suitable foraging habitat on the SEZ could be directly affected by construction and operations (Table 9.1.12.1-1). This direct effects area represents about 0.3% of available suitable foraging habitat in the SEZ region. About 39,678 acres (161 km^2) of potentially suitable foraging habitat occurs in the area of potential indirect effects; this area represents about 2.8% of the available suitable foraging habitat in the SEZ region (Table 9.1.12.1-1). Most of the potentially suitable habitat in the affected area is foraging habitat represented by desert shrubland. On the basis of an evaluation of CAReGAP land cover types, there is no potentially suitable roosting habitat (rocky cliffs and outcrops) in the affected area.

The overall impact on the pallid bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the Imperial East SEZ is considered small, because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of all potentially suitable foraging habitats is not feasible because potentially suitable habitat is widespread throughout the area of direct effect and readily available in other portions of the SEZ region.

Townsend's Big-Eared Bat

The Townsend's big-eared bat is a year-round resident in southern California within the Imperial East SEZ region. According to the CAReGAP land cover model, approximately 5,721 acres (23 km^2) of potentially suitable foraging habitat on the SEZ could be directly affected by construction and operations (Table 9.1.12.1-1). This direct impact area represents about 0.2% of available suitable foraging habitat in the SEZ region. About 75,484 acres (305 km^2) of potentially suitable foraging habitat occurs in the area of potential indirect effects; this area represents about 2.6% of the available suitable foraging habitat in the SEZ region (Table 9.1.12.1-1). Most of the potentially suitable habitat in the affected area is foraging habitat represented by desert shrubland. On the basis of an evaluation of CAReGAP land cover types, there is no potentially suitable roosting habitat (rocky cliffs and outcrops) in the affected area.

The overall impact on the Townsend's big-eared bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the Imperial East SEZ is considered small, because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of all potentially suitable foraging habitats is not feasible because potentially suitable habitat is widespread throughout the area of direct effect and readily available in other portions of the SEZ region.

Western Mastiff Bat

The western mastiff bat is a year-round resident in southern California within the Imperial East SEZ region. According to the CAReGAP land cover model, approximately 5,721 acres (23 km^2) of potentially suitable foraging habitat on the SEZ could be directly affected by construction and operations (Table 9.1.12.1-1). This direct effects area represents about 0.2% of available suitable foraging habitat in the SEZ region. About 75,484 acres (305 km^2) of potentially suitable foraging habitat occurs in the area of potential indirect effects; this area represents about 3.1% of the available suitable foraging habitat in the SEZ region (Table 9.1.12.1-1). Most of the potentially suitable habitat in the affected area is foraging habitat represented by desert shrubland. On the basis of an evaluation of CAReGAP land cover types, there is no potentially suitable roosting habitat (rocky cliffs and outcrops) in the affected area.

The overall impact on the western mastiff bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the Imperial East SEZ is considered small, because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of all potentially suitable foraging habitats is not feasible because potentially suitable habitat is widespread throughout the area of direct effect and readily available in other portions of the SEZ region.

9.1.12.2.4 Impacts on State-Listed Species

There are two species listed by the state of California that could occur in the affected area of the Imperial East SEZ (Table 9.1.12.1-1): California black rail and Yuma clapper rail. Impacts on each of these species were previously discussed in Section 9.1.12.2.1 or Section 9.1.12.2.3 because of their status under the ESA or BLM.

9.1.12.2.5 Impacts on Rare Species

There are 35 species that have a state status of S1 or S2 in California or are listed as species of concern by the state of California or USFWS that may occur in the affected area of the Imperial East SEZ. Impacts have been previously discussed for 16 of these species that are also listed under the ESA (Section 9.1.12.2.1), proposed for listing under the ESA (Section 9.1.12.2.2), BLM-designated sensitive (Section 9.1.12.2.3), or state-listed (Section 9.1.12.2.4). Impacts on the remaining 19 rare species that do not have any other special status designation are presented in Table 9.1.12.1-1.

9.1.12.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A, Section A.2.2, would greatly reduce or eliminate the potential for effects of utility-scale solar energy development on special status species. While some SEZ-specific design features are best established when specific project details are being considered, some design features can be identified at this time, including the following:

- Pre-disturbance surveys should be conducted within the SEZ to determine the presence and abundance of all special status species, including those identified in Table 9.1.12.1-1; disturbance to occupied habitats for these species should be avoided or minimized to the extent practicable. If avoiding or minimizing impacts on occupied habitats is not possible, and where appropriate, translocation of individuals from areas of direct effect; or compensatory mitigation of direct effects on occupied habitats could reduce impacts. A comprehensive mitigation strategy for special status species that uses one or more of these options to offset the impacts of development should be developed in coordination with the appropriate federal and state agencies.

- Disturbance of wetland habitats within the SEZ should be avoided or minimized to the extent practicable. Adverse impacts on the following species could be reduced with the avoidance of desert riparian, wash, and wetland habitats: bitter hymenoxys, brown turbans, California satintail, coves' cassia, dwarf germander, Emory's crucifixion-thorn, mud nama, Munz's cholla, sand evening-primrose, Colorado Desert fringe-toed lizard, California black rail, ferruginous hawk, least bittern, white-faced ibis, Yuma clapper rail, California leaf-nosed bat, pallid bat, pocketed free-tailed bat, Townsend's big-eared bat, western mastiff bat, and Yuma hispid cotton rat.

- Avoidance of desert dunes and sand transport systems on the SEZ could reduce impacts on several special status species, including the Abrams' spurge, chaparral sand-verbena, dwarf germander, flat-seeded spurge, giant Spanish-needle, Harwood's milkvetch, sand food, slender cottonheads, Wiggins' croton, Colorado Desert fringe-toed lizard, and flat-tailed horned lizard.

- As California fully protected species, direct and indirect impacts on the California black rail and Yuma clapper rail should be completely avoided.

- Consultations with the USFWS and the CDFG should be conducted to address the potential for impacts on the Yuma clapper rail a species listed as endangered under the ESA and CESA. Consultation would identify an appropriate survey protocol, avoidance measures, and, if appropriate, reasonable and prudent alternatives, reasonable and prudent measures, and to determine any addition mitigation requirements beyond those already afforded to the Yuma clapper rail as a California fully protected species.

- Coordination with the USFWS and CDFG should be conducted to address the potential for impacts on the flat-tailed horned lizard, a species that is proposed for listing under the ESA. Coordination would identify an appropriate survey protocol, avoidance measures, and, potentially, translocation or compensatory mitigation.

- Harassment or disturbance of special status species and their habitats in the affected area should be mitigated. This can be accomplished by identifying any additional sensitive areas and implementing necessary protection measures based upon consultation with the USFWS and CDFG.

If these SEZ-specific design features are implemented in addition to other project design features, impacts on the special status and rare species could be reduced.

9.1.13 Air Quality and Climate

9.1.13.1 Affected Environment

9.1.13.1.1 Climate

The proposed Imperial East SEZ is located in the south central portion of Imperial County in the southeastern corner of California, along the Arizona and U.S.–Mexico borders. The SEZ with an average elevation of about 94 ft (29 m) lies in the northwestern portion of the Sonoran Desert, which has a low desert climate. As a result, the area surrounding the SEZ is one of the hottest and driest parts of California, characterized by temperate winters and hot, dry summers, large daily temperature swings, scant precipitation, high evaporation rates, low relative humidity, and abundant sunshine. Meteorological data collected at the Imperial Airport and Calexico stations, which are about 21 mi (34 km) west–northwest of and 15 mi (24 km) west of the Imperial East SEZ, respectively, are summarized below.

A wind rose from the Imperial Airport in Imperial, California for the 5 years including 2004 to 2007 and 2009, and taken at a level of 33 ft (10 m), is presented in Figure 9.1.13.1-1 (NCDC 2010a). During this period, the annual average wind speed at the airport was about 7.2 mph (3.2 m/s), with a prevailing wind direction from the west (about 17.9% of the time) and secondarily from the west–southwest (about 12.8% of the time). Predominant west winds are reflective of the statewide prevailing westerlies, because the airport is located in the middle of a wide valley and winds are not affected by local terrain (NCDC 2010b). Winds for the period were predominantly from the west throughout the year, except in July and August, when winds were mostly from the southeast. Wind speeds categorized as calm (less than 1.1 mph [0.5 m/s]) occurred frequently (about 17% of the time) because of the stable conditions caused by strong radiative cooling from late night to sunrise. Average wind speeds by season were the highest in spring at 8.6 mph (3.9 m/s), lower in summer and fall at 7.9 mph (3.5 m/s) and 6.4 mph (2.9 m/s), respectively, and lowest in winter at 5.8 mph (2.6 m/s).

Imperial County experiences a very hot and dry climate due to large-scale sinking and compressional warming of air in the semipermanent Pacific high-pressure system centered off the California coast except in winter. For the 1904 to 2009 period, the annual average temperature at Calexico was 71.1°F (21.7°C) (WRCC 2010b). January was the coldest month, with an average minimum temperature of 39.0°F (3.9°C), and July was the warmest month with an average maximum of 103.9°F (39.9°C). On most days in summer, daytime maximum temperatures were in the 100s, and minimums were in the upper 60s or higher. The minimum temperatures recorded were below freezing (≤32°F [0°C]) on five days in January and four days in December, but subzero temperatures were never recorded. During the same period, the highest temperature, 117°F (47.2°C), was reached in July 1905, and the lowest, 21°F (–6.1°C) was reached in January 1913. In a typical year, about 166 days had a maximum temperature of ≥90°F (32.2°C), while about 11 days had minimum temperatures at or below freezing.

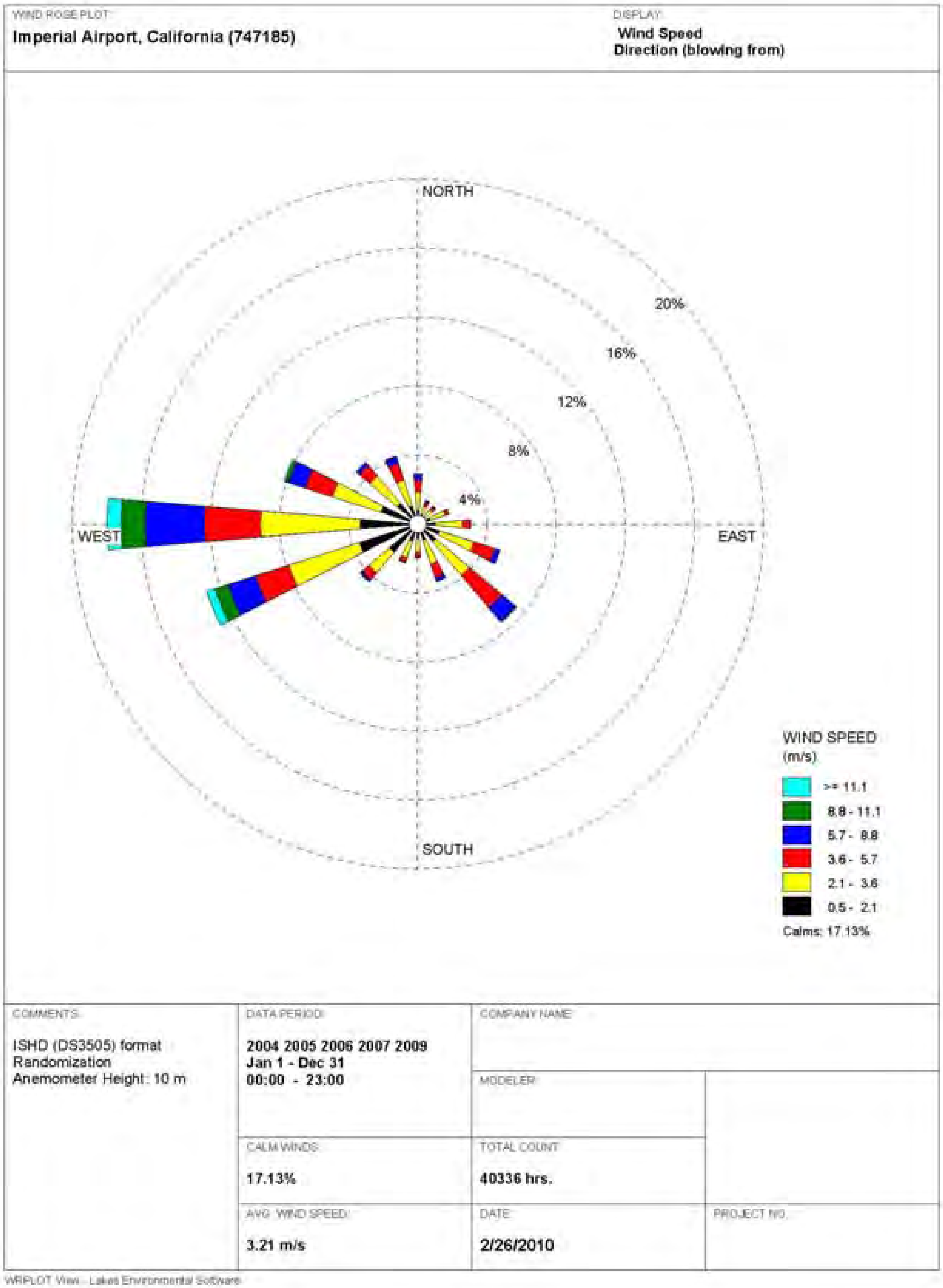

FIGURE 9.1.13.1-1 Wind Rose at 33-ft (10-m) Height at Imperial Airport, Imperial, California, 2004–2007, 2009 (Source: NCDC 2010a)

Driven by the prevailing westerlies, cool and humid air masses from the Pacific Ocean lose most of their moisture on the windward side of western mountain ranges parallel to the California coastline. Thus, Imperial County on the leeward side experiences a lack of precipitation. For the 1904 to 2009 period, annual precipitation at Calexico averaged about 2.67 in. (6.8 cm) (WRCC 2010b). There is an average of 12 days annually with measurable precipitation (0.01 in. [0.025 cm] or higher). About 60% of the annual precipitation occurs during August and the three winter months, while spring has the lowest precipitation. No measurable snowfall at Calexico was ever recorded.

Because a semipermanent Pacific high-pressure system centered off the California coast deflects most storms far to the north except in winter, Imperial County rarely experiences severe weather events, such as thunderstorms, hurricanes, and tornadoes. Many thunderstorms in California are accompanied by little or no precipitation, and lightning strikes sometimes cause forest fires (NCDC 2010b).

Each year some flash flooding is reported as a result of thunderstorms with heavy rains, especially in areas with steep slopes. Since 1999, eight floods (mostly flash floods) were reported in Imperial County (NCDC 2010c), one of which did cause minimal property damage.

In Imperial County, six hail events in total, which caused no property or crop damage, have been reported since 1990. Hail measuring 1.75 in. (4.4 cm) in diameter was reported in 1990 and 2008. In Imperial County, one high-wind event was reported in 2007, and 33 thunderstorm wind events have been reported since 1955; those with a maximum wind speed of up to 100 mph (45 m/s) have occurred mostly from July through September, causing some property damage (NCDC 2010c).

Since 1999, eight dust storm events, occurring from late spring to early fall, were reported in Imperial County (NCDC 2010c). The ground surface of the SEZ is covered predominantly with fine sands and loamy fine sands, which have relatively high dust storm potential. High winds can trigger large amounts of blowing dust in areas of Imperial County that have dry and loose soils with sparse vegetation. Dust storms can deteriorate air quality and visibility and have adverse effects on health, particularly for people with asthma or other respiratory problems.

Historically, two Category one hurricane and four tropical storms/depressions have passed within 100 mi (160 km) of the proposed Imperial East SEZ (CSC 2010). In the period 1950 to June 2010, a total of seven tornadoes (0.1 per year) were reported in Imperial County (NCDC 2010c). However, most tornadoes were relatively weak (i.e., one was uncategorized, four were F0, and two were F1 on the Fujita tornado scale). One of these tornadoes caused minor property damage. None of the tornadoes in Imperial County were reported near the proposed Imperial East SEZ.

9.1.13.1.2 Existing Air Emissions

Imperial County, which encompasses the proposed Imperial East SEZ, has many industrial emission sources, which are mostly concentrated over the central Imperial Valley, a metropolitan and agricultural region. Several geothermal power plants representing point source emissions are located to the northwest of the SEZ and produce relatively minor volatile organic compound (VOC) emissions. Mobile source emissions are substantial because the county is crossed by a major interstate highway, I-8, and many state and county routes. Data on annual emissions of criteria pollutants and VOCs in Imperial County are presented in Table 9.1.13.1-1 for 2002 (WRAP 2009). Emission data are classified into six source categories: point, area, onroad mobile, nonroad mobile, biogenic, and fire (wildfires, prescribed fires, agricultural fires, structural fires). In 2002, nonroad sources were major contributors to total SO_2 and NO_x emissions (about 72% and 36%, respectively). Onroad sources were secondary contributors to NO_x emissions (about 33%), but with contributions comparable to nonroad sources. Onroad sources were major contributors to CO emissions (about 38%). Biogenic sources (i.e., vegetation—including trees, plants, and crops—and soils) that release naturally occurring emissions accounted for most of VOC emissions (about 94%) and secondarily contributed to CO emissions (about 35%). Area sources accounted for about 90% of PM_{10} and 72% of $PM_{2.5}$. Fire sources are minor secondary contributors to SO_2 and $PM_{2.5}$ emissions. In Imperial County, point sources are minor contributors to all criteria pollutants and VOC emissions.

TABLE 9.1.13.1-1 Annual Emissions of Criteria Pollutants and VOCs in Imperial County, California, Encompassing the Proposed Imperial East SEZ, 2002[a]

Pollutant	Emissions (tons/yr)
SO_2	499
NO_x	14,520
CO	70,360
VOC	150,725
PM_{10}	19,367
$PM_{2.5}$	5,542

[a] Includes point, area, onroad and nonroad mobile, biogenic, and fire emissions.

[b] Notation: CO = carbon monoxide; NO_x = nitrogen oxides; $PM_{2.5}$ = particulate matter with a diameter of ≤2.5 μm; PM_{10} = particulate matter with a diameter of ≤10 μm; SO_2 = sulfur dioxide; and VOC = volatile organic compounds.

Source: WRAP (2009).

In 2006, California produced about 483.9 MMt of *gross*[10] carbon dioxide equivalent (CO_2e)[11] emissions (CARB 2010a). Gross greenhouse gas (GHG) emissions in California increased by about 12% from 1990 to 2006, which was three-fourths of the increase in the national rate (about 16%). In 2006, transportation (38.4%) and electricity use (21.9%) were the primary contributors to gross GHG emission sources in California. Fossil fuel use in the residential, commercial, and industrial (RCI) sectors combined accounted for about 29.0% of total state emissions. California's *net* emissions were about 479.8 MMt CO_2e, considering carbon sinks from forestry activities and agricultural soils throughout the state. The EPA (2009a) also estimated 2005 emissions in California. Its estimate of CO_2 emissions from fossil fuel combustion was 390.6 MMt, which was comparable to the state's estimate. The transportation and RCI sectors accounted for about 58.7% and 30.5% of the

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10 Excluding GHG emissions removed as a result of forestry and other land uses and excluding GHG emissions associated with exported electricity.

11 A measure used to compare the emissions from various GHGs on the basis of their global warming potential, defined as the cumulative radiative forcing effects of a gas over a specified time horizon resulting from the emission of a unit mass of gas relative to a reference gas, CO_2. The CO_2e for a gas is derived by multiplying the mass of the gas by the associated global warming potential.

CO_2 emissions total, respectively, while the electric power generation accounted for the remainder (about 10.8%).

9.1.13.1.3 Air Quality

California Ambient Air Quality Standards (CAAQS) address the same six criteria pollutants as does the National Ambient Air Quality Standards (NAAQS) (CARB 2010b; EPA 2010a): sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), ozone (O_3), particulate matter (PM; PM_{10} and $PM_{2.5}$) and lead (Pb). CAAQS are more stringent than the NAAQS for most of criteria pollutants. In addition, California has set standards for some pollutants that are not addressed by the NAAQS: visibility-reducing particles, sulfates, hydrogen sulfide, and vinyl chloride. The NAAQS and CAAQS for criteria pollutants are presented in Table 9.1.13.1-2.

Imperial County is located administratively within Southeast Desert Intrastate Air Quality Control Region (AQCR) (Title 40, Part 81, Section 167 of the *Code of Federal Regulations* [40 CFR 81.167]), along with parts of Kern, Los Angeles, Riverside, and San Bernardino Counties. In addition, the Imperial East SEZ is located within the Salton Sea Air Basin, 1 of 15 geographic air basins designated for the purpose of managing air resources in California, which also includes the Coachella Valley in the central portion of Riverside County. Currently, the area surrounding the proposed SEZ is designated as being in attainment of NAAQS for all criteria pollutants, except O_3 and PM_{10} (40 CFR 81.305). The central Imperial Valley is designated as a nonattainment area for $PM_{2.5}$, but the proposed Imperial East SEZ is located outside the nonattainment area boundary. Further, area designations by the state based on the CAAQS are almost the same as those based on the NAAQS (CARB 2010c), except that only the City of Calexico is designated as an nonattainment area for $PM_{2.5}$ based on the CAAQS.

Air quality in Imperial County is frequently poor, especially with respect to O_3 and PM_{10} levels. Imperial County has favorable conditions for high O_3 production, such as high temperature, intense solar radiation, and little precipitation. Large areas of barren lands and agricultural lands in Imperial County contribute to higher PM concentrations under high winds. PM concentrations are dominated by primary PM, which includes windblown dust from paved and unpaved roads, agricultural activities, construction activities, and dust transported from the South Coast region, San Diego, and densely populated Mexicali in Mexico across the border.

There are no ambient air monitoring stations in the area surrounding the proposed Imperial East SEZ. To characterize ambient air quality around the SEZ, two representative monitoring stations in Calexico were chosen: Calexico—East, about 10 mi (16 km) to the west, and Calexico High School, about 15 mi (24 km) to the west of the SEZ. Ambient concentrations of NO_2, CO, and O_3 are recorded at the former station, while all criteria pollutants are recorded at the latter station. The background concentrations of criteria pollutants at these stations for the 2004 to 2008 period are presented in Table 9.1.13.1-2 (EPA 2010b). Monitored SO_2, NO_2, CO, and Pb levels at either station were lower than their respective standards. Monitored O_3, PM_{10}, and $PM_{2.5}$ exceeded both the NAAQS and CAAQS, except annual average $PM_{2.5}$ levels, which were lower than the NAAQS but higher than the CAAQS.

TABLE 9.1.13.1-2 NAAQS, CAAQS and Background Concentration Levels Representative of the Proposed Imperial East SEZ in Imperial County, California, 2004–2008

				Background Concentration Level	
Pollutant[a]	Averaging Time	NAAQS	CAAQS	Concentration[b,c]	Measurement Location, Year
SO_2	1-hour	0.075 ppm[d]	0.25 ppm	0.162 ppm (–; 65%)	Calexico, 2006
	3-hour	0.5 ppm	–[e]	0.066 ppm (13%; –)	Calexico, 2006
	24-hour	0.14 ppm	0.04 ppm	0.019 ppm (14%; 48%)	Calexico, 2006
	Annual	0.030 ppm	–	0.002 ppm (6.7%; –)	Calexico, 2006
NO_2	1-hour	0.100 ppm[f]	0.18 ppm	0.107 ppm (–; 59%)	Calexico, 2007
	Annual	0.053 ppm	0.030 ppm	0.012 ppm (23%; 40%)	Calexico, 2006
CO	1-hour	35 ppm	20 ppm	9.8 ppm (28%; 49%)	Calexico, 2005
	8-hour	9 ppm	9.0 ppm	7.4 ppm (82%; 82%)	Calexico, 2005
O_3	1-hour	0.12 ppm[g]	0.09 ppm	0.107 ppm (–; 119%)	Calexico, 2007
	8-hour	0.075 ppm	0.070 ppm	0.083 ppm (111%; 119%)	Calexico, 2007
PM_{10}	24-hour	150 $\mu g/m^3$	50 $\mu g/m^3$	154 $\mu g/m^3$ (103%; 308%)	Calexico, 2004
	Annual	–[h]	20 $\mu g/m^3$	66 $\mu g/m^3$ (–; 330%)	Calexico, 2007
$PM_{2.5}$	24-hour	35 $\mu g/m^3$	–	46 $\mu g/m^3$ (131%; –)	Calexico, 2006
	Annual	15.0 $\mu g/m^3$	12 $\mu g/m^3$	13.3 $\mu g/m^3$ (89%; 111%)	Calexico, 2005
Pb	30-day	–	1.5 $\mu g/m^3$	–	–
	Calendar quarter	1.5 $\mu g/m^3$	–	0.03 $\mu g/m^3$ (2.0%; –)	Calexico, 2007
	Rolling 3-month	0.15 $\mu g/m^3$ [i]	–	–	–

a Notation: CO = carbon monoxide; NO_2 = nitrogen dioxide; O_3 = ozone; Pb = lead; $PM_{2.5}$ = particulate matter with a diameter of ≤2.5 μm; PM_{10} = particulate matter with a diameter of ≤10 μm; and SO_2 = sulfur dioxide.

b Monitored concentrations are the highest for calendar-quarter Pb; second-highest for all averaging times less than or equal to 24-hour averages, except fourth-highest daily maximum for 8-hour O_3 and the 98th percentile for 24-hour $PM_{2.5}$; and arithmetic mean for annual SO_2, NO_2, PM_{10}, and $PM_{2.5}$.

c First and second values in parentheses are background concentration levels as a percentage of NAAQS and CAAQS, respectively. Calculation of 1-hour SO_2, 1-hour NO_2, and rolling 3-month Pb to NAAQS was not made because no measurement data based on new NAAQS standards are available.

d Effective August 23, 2010.

e A dash denotes "not applicable" or "not available."

f Effective April 12, 2010.

g The EPA revoked the 1-hour O_3 standard in all areas, although some areas have continuing obligations under that standard ("anti-backsliding").

h Effective December 18, 2006, the EPA revoked the annual PM_{10} standard of 50 $\mu g/m^3$.

i Effective January 12, 2009.

Sources: CARB (2010b); EPA (2010a,b).

The Prevention of Significant Deterioration (PSD) regulations (see 40 CFR 52.21), which are designed to limit the growth of air pollution in clean areas, apply to a major new source or modification of an existing major source within an attainment or unclassified area (see Section 4.11.2.3). As a matter of policy, EPA recommends that the permitting authority notify the Federal Land Managers when a proposed PSD source would locate within 62 mi (100 km) of a sensitive Class I area. There are several Class I areas around the Imperial East SEZ, but none of the Class I areas are located within 62 mi (100 km). The nearest Class I area is the Joshua Tree National Park (NP) (40 CFR 81.405), about 69 mi (111 km) north–northwest of the SEZ, which is not in the direction of prevailing winds at the SEZ (Figure 9.1.13.1-1). The next nearest Class I areas are the San Jacinto WA and the Agua Tibia WA, which are located about 103 mi (165 km) northwest and 108 mi (174 km) west-northwest of the SEZ, respectively.

9.1.13.2 Impacts

Potential impacts on ambient air quality associated with a solar project would be of most concern during the construction phase. Impacts on ambient air quality from fugitive dust emissions resulting from soil disturbances are anticipated, but they would be of short duration. During the operations phase, only a few sources with generally low-level emissions would exist for any of the four types of solar technologies evaluated. A solar facility would either not burn fossil fuels or burn only small amounts during operation. (For facilities using heat transfer fluids [HTFs], fuel could be used to maintain the temperature of the HTFs for more efficient daily start-up.) Conversely, solar facilities would displace air emissions that would otherwise be released from fossil fuel power plants.

Air quality impacts shared by all solar technologies are discussed in detail in Section 5.11.1, and technology-specific impacts are discussed in Section 5.11.2. Impacts specific to the proposed Imperial East SEZ are presented in the following sections. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through any additional mitigation applied. Section 9.1.13.3 below identifies SEZ-specific design features of particular relevance to the Imperial East SEZ.

9.1.13.2.1 Construction

The Imperial East SEZ has a relatively flat terrain; thus only a minimum number of site preparation activities, perhaps with no large-scale earthmoving operations, would be required. However, fugitive dust emissions from soil disturbances during the entire construction phase would be a major concern, because of the large areas that would be disturbed in a region that experiences windblown dust problems. Fugitive dusts, which are released near ground level, typically have more localized impacts than similar emissions from an elevated stack with additional plume rise induced by buoyancy and momentum effects.

Methods and Assumptions

Air quality modeling for PM_{10} and $PM_{2.5}$ emissions associated with construction activities was performed using the EPA-recommended AERMOD model (EPA 2009b). Details for emissions estimation, the description of AERMOD, input data processing procedures, and modeling assumptions are described in Section M.13 of Appendix M. Estimated air concentrations were compared with the applicable NAAQS/CAAQS levels at the site boundaries and nearby communities.[12] No PSD increment levels at the nearby Class I areas were estimated, because all such areas are located more than 62 mi (100 km) from the SEZ, which is farther than maximum modeling distance of 31 mi (50 km) for AERMOD, and not downwind of prevailing winds in the area. For the Imperial East SEZ, the modeling was conducted based on the following assumptions and input:

- Uniformly distributed emissions over the 3,000 acres (12.1 km^2) in the western portion of the SEZ, close to the nearest residences (IID employee housings) and the nearby communities, such as Holtville;

- Surface hourly meteorological data from the Imperial Airport and upper air sounding data from Miramar Naval Air Station near San Diego for the 5-year period (2004 to 2007 and 2009); and

- A regularly spaced receptor grid over a modeling domain of 62 mi × 62 mi (100 km × 100 km) centered on the proposed SEZ, and additional discrete receptors at the SEZ boundaries.

Results

The modeling results for both PM_{10} and $PM_{2.5}$ concentration increments and total concentrations (modeled plus background concentrations) that would result from construction-related fugitive emissions are summarized in Table 9.1.13.2-1. Maximum 24-hour PM_{10} concentration increments modeled to occur at the site boundaries would be an estimated 574 μg/m^3, which far exceeds the relevant standards of 150 or 50 μg/m^3. Total 24-hour PM_{10} concentrations of 728 μg/m^3 at the SEZ boundary would also exceed the standard. However, high PM_{10} concentrations would be limited to the immediate area surrounding the SEZ boundary and would decrease quickly with distance. Predicted maximum 24-hour PM_{10} concentration increments at the nearest residences, which are employee housing for the IID located about 500 ft (150 m) south of the southwestern corner of the SEZ, would be about 170 μg/m^3. Predicted maximum 24-hour PM_{10} concentration increments would be about 27 μg/m^3 at the next nearest residences (about 2.7 mi [4.3 km] west of the SEZ), about 12 μg/m^3 at Yuma, about 11 μg/m^3 at Holtville, and 5 μg/m^3 or lower at all other nearby cities. Modeled annual average

[12] To provide a quantitative assessment, the modeled air impacts of construction were compared to the NAAQS/CAAQS levels. Only monitored data can be used to determine the attainment status. Modeled data are used to assess potential problems and as a consideration in the permitting process.

TABLE 9.1.13.2-1 Maximum Air Quality Impacts from Emissions Associated with Construction Activities for the Proposed Imperial East SEZ

			Concentration (μg/m^3)				Percent of NAAQS/CAAQS[e]	
Pollutant[a]	Averaging Time	Rank[b]	Maximum Increment[b]	Background[c]	Total	NAAQS/ CAAQS[d]	Increment	Total
PM_{10}	24 hours	H6H	574	154	728	150/50	383/1,149	486/1,457
	Annual	NA[f]	69.1	66	135	NA/20	NA/345	NA/675
$PM_{2.5}$	24 hours	H8H	38.0	46	84.0	35/NA	108/NA	240/NA
	Annual	NA	6.9	13.3	20.2	15.0/12	46/58	134/168

[a] $PM_{2.5}$ = particulate matter with a diameter of ≤2.5 μm; PM_{10} = particulate matter with a diameter of ≤10 μm.

[b] Concentrations for attainment demonstration are presented. H6H = highest of the sixth-highest concentrations at each receptor over the 5-year period. H8H = highest of the multiyear average of the eighth-highest concentrations at each receptor over the 5-year period. For the annual average, multiyear averages of annual means over the five-year period are presented. Maximum concentrations are predicted to occur at the site boundaries.

[c] See Table 9.1.13.1-2.

[d] First and second values are NAAQS and CAAQS, respectively.

[e] First and second values are concentration levels as a percentage of NAAQS and CAAQS, respectively.

[f] NA = not applicable.

increment and total (increment plus background) PM_{10} concentrations at the SEZ boundary would be about 69.1 μg/m^3 and 135 μg/m^3, respectively, which are much higher than the CAAQS level of 20 μg/m^3. Modeled increment and background concentrations make comparable contributions to this total. Annual PM_{10} increments would be much lower, about 10 μg/m^3 at the nearest residences and about 1 μg/m^3 or lower for the other mentioned residences and cities; these levels are well below the CAAQS of 20 μg/m^3. Modeled 24-hour total $PM_{2.5}$ concentrations would be 84.0 μg/m^3 at the SEZ boundary, which is higher than the NAAQS of 35 μg/m^3, while the annual average total $PM_{2.5}$ concentration would be 20.2 μg/m^3, which is above both the NAAQS and CAAQS of 15.0 and 12 μg/m^3, respectively. Modeled annual average $PM_{2.5}$ increments would be lower than its respective standards, but total concentrations would exceed standards because of relatively high background contributions. At the nearest residences, predicted maximum 24-hour and annual $PM_{2.5}$ concentration increments would be about 5.0 and 1.3 μg/m^3, respectively.

As mentioned, no AERMOD modeling was made for nearby Class I areas because of the distances from the SEZ. Considering distances, prevailing winds, and topography, contours of predicted concentration levels over the modeling domain indicates that no Class I PSD increments are anticipated to be exceeded at the nearby Class I areas, including the nearest one (Joshua Tree NP).

In conclusion, predicted 24-hour and annual PM_{10} and $PM_{2.5}$ concentration levels could exceed the standard levels at the SEZ boundaries and immediate surrounding areas during the construction of solar facilities. To reduce potential impacts on ambient air quality and in compliance with BLM design features, aggressive dust control measures would be used. Potential air quality impacts on any nearby residences and cities would be much lower. Modeling indicates that construction activities could result in negligible impacts on the nearest federal Class I area (Joshua Tree NP), which are located about 69 mi (111 km) from the SEZ. Accordingly, it is anticipated that impacts of construction activities on ambient air quality would be moderate and temporary.

Construction emissions from the engine exhaust from heavy equipment and vehicles could cause impacts on air-quality-related values (AQRVs) (e.g., visibility and acid deposition) at the nearby federal Class I areas. SO_x emissions from engine exhaust would be very low, because BLM design features would require that ultra-low-sulfur fuel with a sulfur content of 15 ppm be used. NO_x emissions from engine exhaust would be primary contributors to potential impacts on AQRVs. Construction-related emissions are temporary in nature and thus would cause some unavoidable but short-term impacts.

For this analysis, the impacts of construction and operation of transmission lines outside of the SEZ were not assessed, assuming that the existing regional 115-kV transmission line might be used to connect some new solar facilities to load centers, and that additional project-specific analysis would be done for new transmission construction or line upgrades. However, some construction of transmission lines could occur within the SEZ. Potential impacts on ambient air quality would be a minor component of construction impacts in comparison with solar facility construction and would be temporary in nature.

9.1.13.2.2 Operations

Emission sources associated with the operation of a solar facility would include auxiliary boilers, vehicle (commuter, visitor, support, and delivery) traffic, maintenance (e.g., mirror cleaning and repair and replacement of damaged mirrors), and drift from cooling towers for the parabolic trough or power tower technology if wet cooling were implemented (drift comprises low-level PM emissions).

The type of emission sources caused by and offset by operation of a solar facility are discussed in Section M.13.4 of Appendix M.

Estimates of potential air emissions displaced by the solar project development at the Imperial East SEZ are presented in Table 9.1.13.2-2. Total power generation capacity ranging from 509 to 916 MW is estimated for the Imperial East SEZ for various solar technologies (see Section 9.1.2). The estimated amount of emissions avoided for the solar technologies evaluated depends only on the megawatts of conventional fossil fuel–generated power displaced, because a composite emission factor per megawatt-hour of power by conventional technologies is assumed (EPA 2009c). If the Imperial East SEZ were fully developed, it is expected that emissions avoided would be somewhat substantial. Development of solar power in the SEZ would result in avoided air emissions ranging from 0.8 to 1.5% of total emissions of SO_2, NO_x, Hg, and CO_2 from electric power systems in the state of California (EPA 2009c). Avoided emissions would be up to 0.3% of total emissions from electric power systems in the six-state study area. When compared with all source categories, power production from the same solar facilities would displace up to 0.29% of SO_2, 0.03% of NO_x, and 0.19% of CO_2 emissions in the state of California (EPA 2009a; WRAP 2009). These emissions would be up to 0.10% of total emissions from all source categories in the six-state study area. Power generation from fossil fuel–fired power plants accounts for only 53% of the total electric power generation in California, most of which is from natural gas combustion. Thus, solar facilities to be built in the Imperial East SEZ could considerably reduce fuel-combustion-related emissions in California but relatively less so than those built in other states with higher fossil use rates.

About one-quarter of the electricity consumed in California is generated out of state, with about three-quarters of this amount coming from the southwestern states. Thus it is possible that a solar facility in California would replace power from fossil fuel–fired power plants outside of California but within the six-state study area. It is also possible that electric power transfer between the states will increase in the future. To assess the potential region-wide emissions benefit, emissions being displaced were also estimated based on composite emission factors averaged over the six-state study area. For SO_2, NO_x, and Hg, composite emission factors for the six-state study area would be about 5 to 6 times higher than those for California alone. For CO_2, the six-state emission factor is about 60% higher than the California-only emission factor. If the Imperial East SEZ were fully developed, emissions avoided would be somewhat considerable. Development of solar power in the SEZ would result in avoided air emissions ranging from 0.27 to 0.48% of total emissions of SO_2, NO_x, Hg, and CO_2 from electric power systems in the six southwestern states. These emissions would be up to 0.26% of total emissions from all source categories in the six-state study area.

TABLE 9.1.13.2-2 Annual Emissions from Combustion-Related Power Generation Displaced by Full Solar Development of the Proposed Imperial East SEZ

Area Size (acres)	Capacity (MW)[a]	Power Generation (GWh/yr)[b]	Emissions Displaced (tons/yr; 10^3 tons/yr for CO_2)[c]			
			SO_2	NO_x	Hg	CO_2
5,722	509–916	891–1,604	114–205 (673–1,212)	187–337 (992–1,786)	0.002–0.003 (0.008–0.014)	443–797 (703–1,266)
Percentage of total emissions from electric power systems in California[d]			0.84–1.5%	0.84–1.5%	0.84–1.5%	0.84–1.5%
Percentage of total emissions from all source categories in California[e]			0.16–0.29%	0.02–0.03%	–[f]	0.10–0.19%
Percentage of total emissions from electric power systems in the six-state study area[d]			0.05–0.08% (0.27–0.48%)	0.05–0.09% (0.27–0.48%)	0.06–0.10% (0.27–0.48%)	0.17–0.30% (0.27–0.48%)
Percentage of total emissions from all source categories in the six-state study area[e]			0.02–0.04% (0.14–0.26%)	0.007–0.012% (0.04–0.07%)	– (–)	0.05–0.10% (0.08–0.15%)

[a] It is assumed that the SEZ would eventually have development on 80% of the lands and that a range of 5 acres (0.020 km^2) per MW (for parabolic trough technology) to 9 acres (0.036 km^2) per MW (power tower, dish engine, and PV technologies) would be required.

[b] Assumed a capacity factor of 20%.

[c] Composite combustion-related emission factors for SO_2, NO_x, Hg, and CO_2 of 0.26, 0.42, 3.7×10^{-6}, and 994 lb/MWh, respectively, were used for the state of California. Values in parentheses are estimated based on composite combustion-related emission factors for SO_2, NO_X, Hg, and CO_2 of 1.51, 2.23, 1.8×10^{-5}, and 1,578 lb/MWh, respectively, averaged over six southwestern states.

[d] Emission data for all air pollutants are for 2005.

[e] Emission data for SO_2 and NO_x are for 2002, while those for CO_2 are for 2005.

[f] A dash indicates not estimated.

Sources: EPA (2009a,c); WRAP (2009).

As discussed in Section 5.11.1.5, the operation of associated transmission lines would generate some air pollutants from activities such as periodic site inspections and maintenance. However, these activities would occur infrequently, and the amount of emissions would be small. In addition, transmission lines could produce minute amounts of O_3 and its precursor NO_x associated with corona discharge (i.e., the breakdown of air near high-voltage conductors), which is most noticeable for high-voltage lines during rain or very humid conditions. Since the Imperial East SEZ is located in an arid desert environment, these emissions would be small, and potential impacts on ambient air quality associated with transmission lines would be negligible, considering the infrequent occurrences and small amount of emissions from corona discharges.

9.1.13.2.3 Decommissioning/Reclamation

As discussed in Section 5.11.1.4, decommissioning/reclamation activities are similar to construction activities but are on a more limited scale and of shorter duration. Potential impacts on ambient air quality would be correspondingly less than those from construction activities. Decommissioning activities would last for a short period, and their potential impacts would be moderate and temporary. The same mitigation measures adopted during the construction phase would also be implemented during the decommissioning phase (Section 5.11.3).

9.1.13.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features are required. Limiting dust generation during construction and operations at the proposed Imperial East SEZ (such as increased watering frequency or road paving or treatment) is a required design feature under BLM's Solar Energy Program. These extensive fugitive dust control measures would keep off-site PM levels as low as possible during construction.

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9.1.14 Visual Resources

9.1.14.1 Affected Environment

The proposed Imperial East SEZ is located approximately 1.2 mi (1.9 km) north of the United States–Mexico border in the Sonoran Desert, within the CDCA in Imperial County in southern California. The SEZ occupies an area of 5,722 acres (23.2 km^2) and measures approximately 2.9 mi (4.7 km) north to south (at greatest extent) and 7.1 mi (11.4 km) east to west. The SEZ is located approximately 10 mi (16 km) (at closest approach) southeast of the town of Holtville, California, and 16 mi (26 km) east of the community of Calexico. I-8 runs along the northeastern boundary of the SEZ, and State Route 98 runs east to west through the southern portion of the SEZ. The SEZ and surrounding mountain ranges are shown in Figure 9.1.14.1-1. The SEZ ranges in elevation from 78 ft (24 m) in the northwestern portion to 127 ft (39 m) in the southeastern portion of the SEZ.

The Imperial East SEZ is located in the Sonoran Basin and Range ecoregion (EPA 2007) and the USFS's East Mesa-Sand Hills subsection, which consists of very gently to moderately sloping alluvial fans and moderately steep to steep sand dunes (USFS 1997).

The SEZ presents a flat, open landscape, mostly treeless, but with shrubs in some areas tall enough to provide partial screening of views. The landscape is visually dominated by the strong horizon line; the closest visible mountain ranges are too far from the SEZ to affect the SEZ's visual values significantly.

Vegetation varies somewhat in different parts of the SEZ. Much of the SEZ is covered with creosote flats consisting of generally tall, widely spaced creosotebushes on gravel, as shown in Figure 9.1.14.1-2. The gravel in the flats is light gray, and because many areas have less than 10% vegetative cover, landscape color in these areas is predominantly gray, scattered with olive green and browns of the creosotebush. Some areas in the south-central portion contain a more dense and diverse set of shrubs, with some small trees and a few palm trees. During an August 2009 site visit, areas with denser vegetation presented a range of gray-blues, greens, golds and browns, as shown in Figure 9.1.14.1-3.

No permanent water features are present on the SEZ. This landscape type is common within the region.

Although the SEZ itself is generally natural appearing, cultural modifications within the SEZ detract markedly from the SEZ's scenic quality. In addition to State Route 98, several gravel and dirt roads of various sizes cross the SEZ. Traffic on I-8 is visible from portions of the SEZ. Several transmission lines, ranging from large, galvanized steel with open lattice, to relatively small, wooden "H" frame towers cross or pass near the SEZ in different directions, and one or more transmission lines are visible from most locations within the SEZ. Communication and camera towers (for monitoring the international border) are also visible from much of the SEZ. Panoramic views of the SEZ are shown in Figures 9.1.14.1-2 and 9.1.14.1-3.

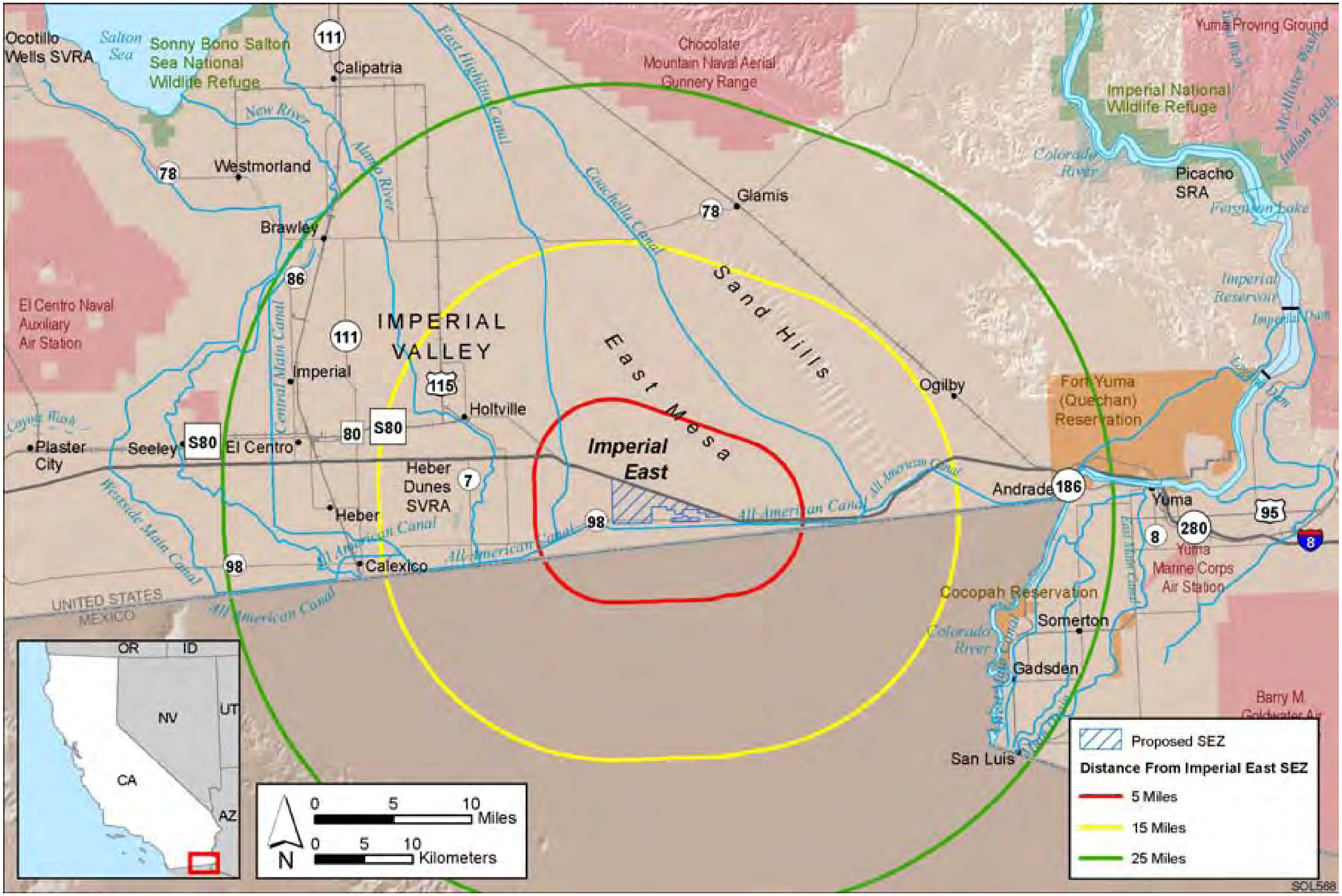

FIGURE 9.1.14.1-1 Proposed Imperial East SEZ and Surrounding Lands

FIGURE 9.1.14.1-2 Approximately 180° Panoramic View of the Proposed Imperial East SEZ, from Northwest Corner of the SEZ near I-8, Looking South

FIGURE 9.1.14.1-3 Approximately 180° Panoramic View of the Proposed Imperial East SEZ, from South-Central Portion of the SEZ near State Route 98, Looking West

Off-site views do little to enhance the scenic quality of the SEZ and offer almost no topographic relief or other features of interest. The SEZ lies in East Mesa, which is bounded by Imperial Valley to the west and Imperial Sand Dunes to the east. Topographic relief on the mesa is low, generally less than 45 ft (13.7 m), and the mesa is characterized by open views. Distant mountains to the south add slightly to the scenic value of views in that direction, but mountains in other directions are too distant to add to the scenic quality of the SEZ. The Imperial Sand Dunes, located approximately 8 to 10 mi (13 to 16 km) northeast of the SEZ, are theoretically visible just above the horizon from portions of the SEZ but are likely screened in most locations within the SEZ by vegetation and small undulations in topography between the SEZ and the dunes.

Immediately south of the SEZ is the All-American Canal, which runs parallel to the southern boundary of the SEZ at a distance of 0.3 mi (0.5 km). The canal is a major man-made water feature. Its two hydropower facilities and associated dams and substations are visible from portions of the SEZ. The structures' strong regular geometry, visual complexity, and more reflective, uniformly colored and smooth surfaces contrast strongly in form, line, color, and texture with the simple, relatively natural-appearing landscape; some viewers, however, might find that the structures add visual interest to an otherwise monotonous landscape.

Also to the south of the SEZ (in Mexico in the vicinity of the SEZ) is the Juan Bautista de Anza Trail, though it is not likely visible from the SEZ (its exact location in the area is not known at this time). This historic trail dates to 1775–1776 as the first overland route to connect New Spain with San Francisco. The Juan Bautista de Anza National Historic Trail approaches to within about 17 mi (27 km) east of the SEZ where it loops south into Mexico and then passes about 10 mi (16 km) south of the SEZ before turning back north into the United States about 20 mi (32 km) west of the SEZ. The trail then heads north and northwest. The auto tour portion of the trail follows State Route 98, within the southern boundary of the SEZ, although the route in this area is not associated with the historic trail.

The BLM conducted a visual resource inventory (VRI) for the SEZ and surrounding lands in 2009 (BLM 2010c). The VRI evaluates BLM-administered lands based on scenic quality; sensitivity level, in terms of public concern for preservation of scenic values in the evaluated lands; and distance from travel routes or key observation points (KOPs). Based on these three factors, BLM-administered lands are placed into one of four VRI Classes, which represent the relative value of the visual resources. Classes I and II are the most valued; Class III represents a moderate value; and Class IV represents the least value. Class I is reserved for specially designated areas, such as national wildernesses and other congressionally and administratively designated areas where decisions have been made to preserve a natural landscape. Class II is the highest rating for lands without special designation. More information about VRI methodology is available in Section 5.12 and in *Visual Resource Inventory*, BLM Manual Handbook 8410-1 (BLM 1986a).

The VRI map for the SEZ and surrounding lands is shown in Figure 9.1.14.1-4. The VRI values for the SEZ and immediate surroundings are VRI Class III, indicating moderate relative visual values, and VRI Class IV, indicating low relative visual values. The inventory indicates low scenic quality for the SEZ and its immediate surroundings, based in part on the lack of visual variety and notable features, and the relative commonness of the landscape type within the region. Positive scenic quality attributes included some variety in vegetation types and color; however, these positive attributes were insufficient to raise the scenic quality to the “Moderate” level. The inventory indicates moderate sensitivity for the SEZ and its immediate surroundings. The inventory indicates relatively low levels of use; however, the overall sensitivity rating is “Moderate” for the following reasons:

1. The SEZ is within the CDCA,

2. There are several ACECs nearby, and

3. The SEZ is adjacent to the auto tour route of the Juan Bautista de Anza National Historic Trail.

Within the El Centro Field Office, lands within the 25-mi (40-km), 650-ft (198-m) viewshed of the SEZ contain 760 acres (3.08 km^2) of VRI Class I lands, north of the SEZ in the Imperial Sand Hills; 4,874 acres (19.72 km^2) of VRI Class II lands, north and northeast of the SEZ in the Imperial Sand Hills; 13,829 acres (55.964 km^2) of Class III lands, primarily north of the SEZ on East Mesa or northeast beyond the Imperial Sand Hills; and 20,188 acres (81.698 km^2) of VRI Class IV lands, north of the SEZ on East Mesa or northeast beyond the Imperial Sand Hills.

More information about VRI methodology is available in Section 5.12 and in *Visual Resource Inventory*, BLM Manual Handbook 8410-1 (BLM 1986a). The BLM has not assigned Visual Resource Management (VRM) classes for the SEZ and surrounding BLM lands. More information about the BLM’s VRM program is available in Section 5.12 and in *Visual Resource Management*, BLM Manual Handbook 8400 (BLM 1984).

9.1.14.2 Impacts

The potential for impacts from utility-scale solar energy development on visual resources within the proposed Imperial East SEZ and surrounding lands, as well as the impacts of related developments (e.g., access roads and transmission lines) outside of the SEZ, is presented in this section.

Site-specific impact assessment is needed to systematically and thoroughly assess visual impact levels for a particular project. Without precise information about the location of a project, a relatively complete and accurate description of its major components and their layout, it is not possible to assess precisely the visual impacts associated with the facility. However, if the general nature and location of a facility are known, a more generalized assessment of potential visual impacts can be made by describing the range of expected visual changes and discussing contrasts typically associated with these changes. In addition, a general analysis can identify sensitive resources that may be at risk if a future project is sited in a particular area. Detailed information about the methodology employed for the visual impact assessment used in this PEIS, including assumptions and limitations, is presented in Appendix M.

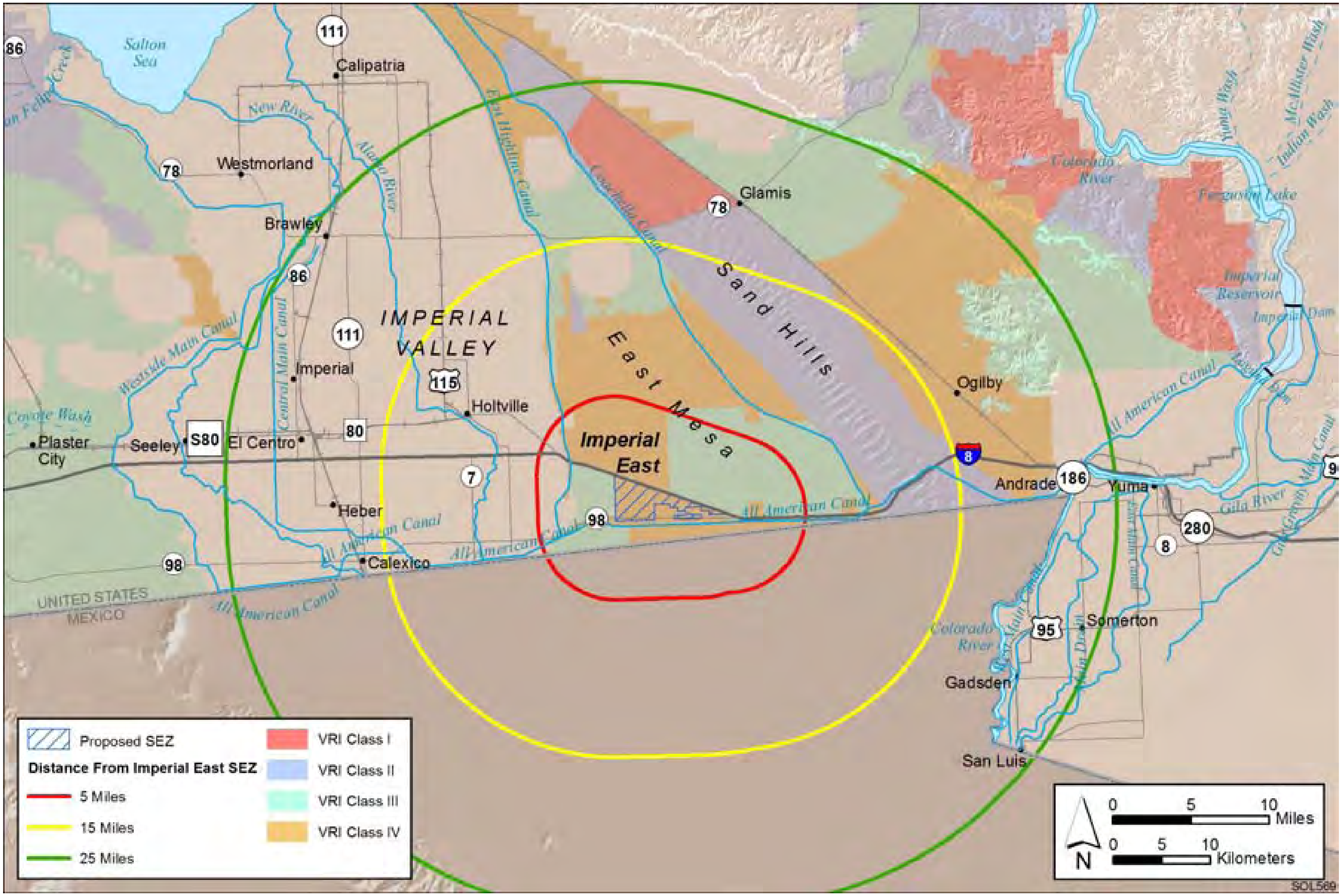

FIGURE 9.1.14.1-4 Visual Resource Inventory Values for the Proposed Imperial East SEZ and Surrounding Lands

Potential Glint and Glare Impacts. Similarly, the nature and magnitude of potential glint- and glare-related visual impacts for a given solar facility is highly dependent on viewer position, sun angle, the nature of the reflective surface and its orientation relative to the sun and the viewer, atmospheric conditions, and other variables. The determination of potential impacts from glint and glare from solar facilities within a given proposed SEZ would require precise knowledge of these variables, and is not possible given the scope of the PEIS. Therefore, the following analysis does not describe or suggest potential contrast levels arising from glint and glare for facilities that might be developed within the SEZ; however, it should be assumed that glint and glare are possible visual impacts from *any* utility-scale solar facility, regardless of size, landscape setting, or technology type. The occurrence of glint and glare at solar facilities could potentially cause large, but temporary, increases in brightness and visibility of the facilities. The visual contrast levels projected for sensitive visual resource areas discussed in the following analysis do not account for potential glint and glare effects; however, these effects would be incorporated into a future site-and project-specific assessment that would be conducted for specific proposed utility-scale solar energy projects. For more information about potential glint and glare impacts associated with utility-scale solar energy facilities, see Section 5.12 of this PEIS.

9.1.14.2.1 Impacts on the Proposed Imperial East SEZ

Some or all of the SEZ could be developed for one or more utility-scale solar energy projects, utilizing one or more of the solar energy technologies described in Appendix F. Because of the industrial nature and large size of utility-scale solar energy facilities, large visual impacts on the SEZ would occur as a result of the construction, operation, and decommissioning of solar energy projects. In addition, large impacts could occur at solar facilities that utilize highly reflective surfaces or major light-emitting facility components (solar dish, parabolic trough, and power tower technologies), with lesser impacts associated with reflective surfaces expected from PV facilities. These impacts would be expected to involve major modification of the existing character of the landscape and would likely dominate the views nearby. Additional, and potentially large impacts would occur as a result of the construction, operation, and decommissioning of related facilities, such as access roads and electric transmission lines within the SEZ (however, no new transmission lines construction outside of the proposed SEZ was assessed; see Section 9.1.1.2). While the primary visual impacts associated with solar energy development within the SEZ would occur during daylight hours, lighting required for utility-scale solar energy facilities would be a potential source of visual impacts at night, both within the SEZ and on surrounding lands.

Common and technology-specific visual impacts from utility-scale solar energy development, as well as impacts associated with electric transmission lines, are discussed in Section 5.12 of this PEIS. Impacts would last throughout construction, operation, and decommissioning, and some impacts could continue after project decommissioning. Visual impacts resulting from solar energy development in the SEZ would be in addition to impacts from solar energy development and other development that may occur on other public or private lands within the SEZ viewshed, and are subject to cumulative effects. For discussion of cumulative impacts, see Section 9.1.22.4.13 of the PEIS.

The changes described above would be expected to be consistent with BLM VRM objectives for VRM Class IV, as seen from nearby KOPs. As noted above, the BLM has not assigned VRM classes for the SEZ and surrounding BLM lands. More information about impact determination using the BLM VRM program is available in Section 5.12 and in *Visual Resource Contrast Rating*, BLM Manual Handbook 8431-1 (BLM 1986b).

Implementation of the programmatic design features intended to reduce visual impacts (described in Appendix A, Section A.2.2 of the PEIS) would be expected to reduce visual impacts associated with utility-scale solar energy development within the SEZ; however, the degree of effectiveness of these design features could be assessed only at the site- and project-specific level. Given the large scale, reflective surfaces, and strong regular geometry of utility-scale solar energy facilities, and the lack of screening vegetation and landforms within the SEZ viewshed, siting the facilities away from sensitive visual resource areas and other sensitive viewing areas would be the primary means of mitigating visual impacts. The effectiveness of other visual impact mitigation measures would generally be limited, but would be important to reduce visual contrasts to the greatest extent possible.

9.1.14.2.2 Impacts on Lands Surrounding the Proposed Imperial East SEZ

Impacts on Selected Sensitive Visual Resource Areas

Because of the large size of utility-scale solar energy facilities and the generally flat, open nature of the proposed SEZ, lands outside the SEZ would be subjected to visual impacts related to construction, operation, and decommissioning of utility-scale solar energy facilities. The affected areas and extent of impacts would depend on a number of visibility factors and viewer distance (for a detailed discussion of visibility and related factors, see Section 5.12). A key component in determining impact levels is the intervisibility between the project and potentially affected lands; if topography, vegetation, or structures screen the project from viewer locations, there is no impact.

Preliminary viewshed analyses were conducted to identify which lands surrounding the proposed SEZ could have views of solar facilities in at least some portion of the SEZ (see Appendix N for important information on the assumptions and limitations of the methods used). Four viewshed analyses were conducted, assuming four different heights representative of project elements associated with potential solar energy technologies: PV and parabolic trough arrays (24.6 ft [7.5 m]), solar dishes and power blocks for CSP technologies (38 ft [11.6 m]), transmission towers and short solar power towers (150 ft [45.7 m]), and tall solar power towers (650 ft [198.1 m]). Viewshed maps for the SEZ for all four solar technology heights are presented in Appendix N.

Figure 9.1.14.2-1 shows the combined results of the viewshed analyses for all four solar technologies. The colored segments indicate areas with clear lines of sight to one or more areas within the SEZ and from which solar facilities within these areas of the SEZ would be expected to be visible, assuming the absence of screening vegetation or structures and adequate lighting and other atmospheric conditions. The light brown areas are locations from which PV and

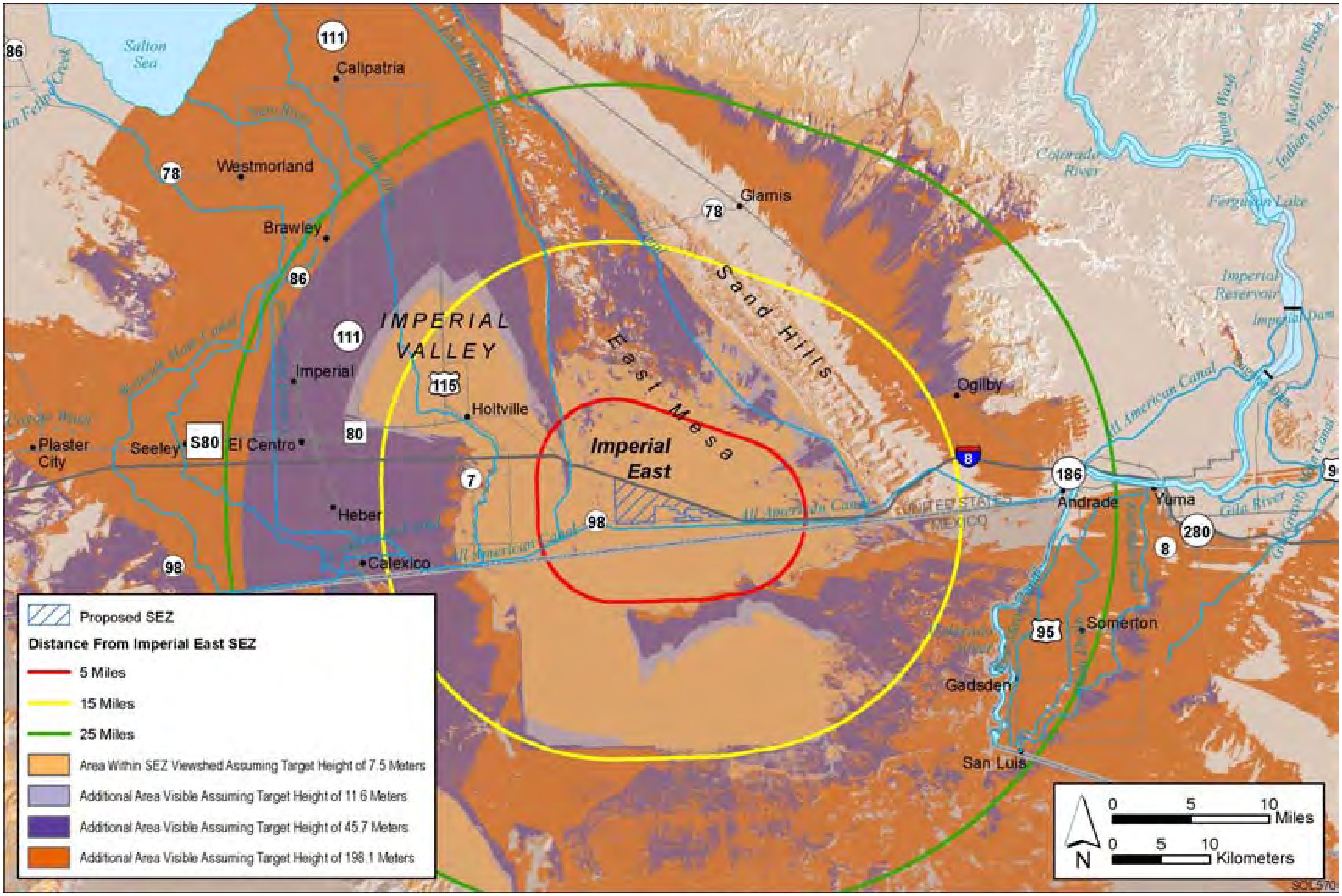

FIGURE 9.1.14.2-1 Viewshed Analyses for the Proposed Imperial East SEZ and Surrounding Lands, Assuming Solar Technology Heights of 24.6 ft (7.5 m), 38 ft (11.6 m), 150 ft (45.7 m), and 650 ft (198.1 m) (shaded areas indicate lands from which solar development within the SEZ could be visible)

parabolic trough arrays located in the SEZ could be visible. Solar dishes and power blocks for CSP technologies would be visible from the areas shaded in light brown and the additional areas shaded in light purple. Transmission towers and short solar power towers would be visible from the areas shaded light brown, light purple, and the additional areas shaded in dark purple. Power tower facilities located in the SEZ could be visible from areas shaded light brown, light purple, dark purple, and for at least the upper portions of power tower receivers could be visible from the additional areas shaded in medium brown.

For the following visual impact discussion, the tall solar power tower (650 ft [198.1 m]) and PV and parabolic trough array (24.6 ft [7.5 m]) viewsheds are shown in figures and discussed in the text. These heights represent the maximum and minimum landscape visibility for solar energy technologies analyzed in the PEIS. Viewsheds for solar dish and CSP technology power blocks (38 ft [11.6 m]) and for transmission towers and short solar power towers (150 ft [45.7 m]) are presented in Appendix N. The visibility of these facilities would fall between that for tall power towers and PV and parabolic trough arrays.

Impacts on Selected Federal-, State-, and BLM-Designated Sensitive Visual Resource Areas

Figure 9.1.14.2-2 shows the results of a GIS analysis that overlays selected federal-, state-, and BLM-designated sensitive visual resource areas onto the combined tall solar power tower (650 ft [198.1 m]) and PV and parabolic trough array (24.6 ft [7.5 m]) viewsheds, in order to illustrate which of these sensitive visual resource areas could have views of solar facilities within the SEZ and therefore potentially would be subject to visual impacts from those facilities. Distance zones that correspond with the BLM's VRM system-specified foreground-middleground distance (5 mi [8 km]), background distance (15 mi [24 km]), and a 25-mi (40-km) distance zone are shown as well, in order to indicate the effect of distance from the SEZ on impact levels, which are highly dependent on distance.

The scenic resources included in the analysis were as follows:

- National Parks, National Monuments, National Recreation Areas, National Preserves, National Wildlife Refuges, National Reserves, National Conservation Areas, National Historic Sites;

- Congressionally authorized Wilderness Areas;

- Wilderness Study Areas;

- National Wild and Scenic Rivers;

- Congressionally authorized Wild and Scenic Study Rivers;

- National Scenic Trails and National Historic Trails;

- National Historic Landmarks and National Natural Landmarks;

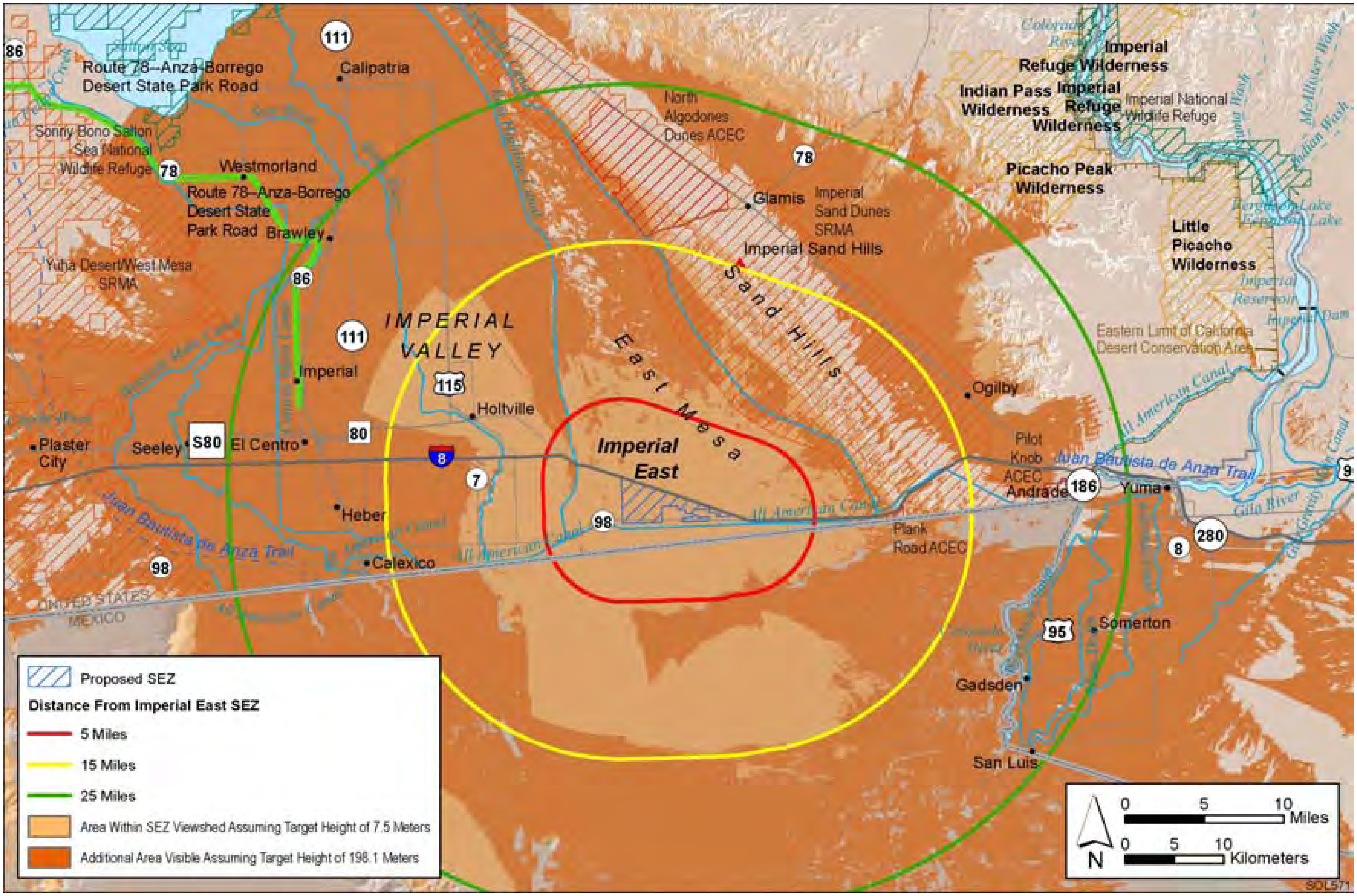

FIGURE 9.1.14.2-2 Overlay of Selected Sensitive Visual Resource Areas onto Combined 650-ft (198.1-m) and 24.6-ft (7.5-m) Viewsheds for the Proposed Imperial East SEZ

- All-American Roads, National Scenic Byways, State Scenic Highways, and BLM- and USFS-designated scenic highways/byways;

- BLM-designated Special Recreation Management Areas; and

- ACECs designated because of outstanding scenic qualities.

Potential impacts on specific sensitive resource areas visible from and within 25 mi (40 km) of the proposed Imperial East SEZ are discussed below. The results of this analysis are also summarized in Table 9.1.14.2-1. Further discussion of impacts on these areas is available in Sections 9.1.3 (Specially Designated Areas and Lands with Wilderness Characteristics) and 9.1.17 (Cultural Resources) of the PEIS.

The following visual impact analysis describes *visual contrast levels* rather than *visual impact levels*. *Visual contrasts* are changes in the seen landscape, including changes in the forms, lines, colors, and textures of objects seen in the landscape. A measure of *visual impact* includes potential human reactions to the visual contrasts arising from a development activity, based on viewer characteristics, including attitudes and values, expectations, and other characteristics that are viewer- and situation-specific. Accurate assessment of visual impacts requires knowledge of the potential types and numbers of viewers for a given development and their characteristics and expectations; specific locations from which the project might be viewed; and other variables that were not available or not feasible to incorporate in the PEIS analysis. These variables would be incorporated into a future site-and project-specific assessment that would be conducted for specific proposed utility-scale solar energy projects. For more discussion of visual contrasts and impacts, see Section 5.12 of the PEIS.

GOOGLE EARTH™ VISUALIZATIONS

The visual impact analysis discussion in this section utilizes three-dimensional Google Earth™ perspective visualizations of hypothetical solar facilities placed within the SEZ. The visualizations include simplified wireframe models of a hypothetical solar power tower facility. The models were placed at various locations within the SEZ as visual aids for assessing the approximate size and viewing angle of utility-scale solar facilities. The visualizations are intended to show the apparent size, distance, and configuration of the SEZ, as well as the apparent size of a typical utility-scale solar power tower project and its relationship to the surrounding landscape, as viewed from potentially sensitive visual resource areas within the viewshed of the SEZ.

The visualizations are not intended to be realistic simulations of the actual appearance of the landscape or of proposed utility-scale solar energy projects. The placement of models within the SEZ did not reflect any actual planned or proposed projects within the SEZ, and did not take into account engineering or other constraints that would affect the siting or choice of facilities for this particular SEZ. The number of facility models placed in the SEZ does not reflect the 80% development scenario analyzed in the PEIS, but it should be noted that the discussion of expected visual contrast levels does account for the 80% development scenario. A solar power tower was chosen for the models because the unique height characteristics of power tower facilities make their visual impact potential extend beyond other solar technology types.

TABLE 9.1.14.2-1 Selected Potentially Affected Sensitive Visual Resources within a 25-mi (40.2-km) Viewshed of the Proposed Imperial East SEZ, Assuming a Viewshed Analysis Target Height of 650 ft (198.1 m)

		Feature Area or Linear Distance[a]		
			Visible between	
Feature Type	Feature Name (Total Acreage/Linear Distance)	Visible within 5 mi	5 and 15 mi	15 and 25 mi
National Conservation Area	California Desert (25,919,319 acres)	9,127 acres (0.0%)[b]	26,738 acres (0.1%)	42,544 acres (0.2%)
WA	North Algodones Dunes (26,330 acres)	0 acres	0 acres	762 acres (2.9%)
National Historic Trail	Juan Batista de Anza	0 mi	0 mi	4 mi
National Natural Landmark	Imperial Sand Hills (NA[c])	NA	NA	NA
ACEC designated for outstanding scenic values	North Algodones Dunes (25,835 acres)	0 acres	0 acres	745 acres (2.9%)

a To convert acres to km^2, multiply by 0.004047; to convert mi to km, multiply by 1.609.

b Percentage of total feature area for areal features.

c NA = data not available.

National Conservation Areas

- *California Desert Conservation Area*—The California Desert Conservation Area (CDCA) is a 26-million-acre (105,000-km^2) parcel of land in southern California designated by Congress in 1976 through the Federal Land Policy and Management Act. About 10 million acres (40,000 km^2) of the CDCA are administered by the BLM. As shown in Figure 9.1.14.2-2, the proposed Imperial East SEZ is located within the CDCA.

  The CDCA management plan notes the "superb variety of scenic values" in the CDCA (BLM 1999) and lists scenic resources as needing management to preserve their value for future generations. The CDCA management plan divides CDCA lands into multiple-use classes on the basis of management objectives. The class designations govern the type and degree of land use actions allowed within the areas defined by class boundaries. All land use actions and resource management activities on public lands within a multiple-use class delineation must meet the guidelines given for that class.

The proposed SEZ is within an area classified as multiple use class “L.” This limited class protects sensitive, natural, scenic, ecological, and cultural resource values. Class L management provides for generally lower-intensity, carefully controlled multiple use of resources, while ensuring that sensitive values are not significantly diminished.

Utility-scale solar development within the SEZ is an allowable use in multiple use Class “L” lands under the CDCA management plan. Construction and operation of solar facilities under the PEIS development scenario would result in substantial visual impacts on the SEZ and some surrounding lands within the SEZ viewshed that could not be completely mitigated.

Portions of the CDCA within the 650-ft (198.1-m) viewshed for the Imperial East SEZ include approximately 78,409 acres (317.3 km^2), or 0.3% of the total CDCA acreage. Portions of the CDCA within the 24.6-ft (7.5-m) viewshed encompass approximately 23,599 acres (95.5 km^2) or 0.1% of the total CDCA acreage. Absent screening and other visibility factors that would prevent viewers from seeing solar energy facilities within the SEZ, all CDCA lands within the SEZ viewshed would be subject to visual impacts from solar development within the SEZ. The nature of the impacts experienced would vary with the distance from the SEZ, the angle of view, project numbers, sizes and locations, and other project- and site-specific factors.

Wilderness Area

- *North Algodones Dunes*—The 26,330-acre (106.6 km^2) North Algodones Dunes Wilderness is a congressionally designated WA located about 16 mi (25 km) at the point of closest approach north of the SEZ. As shown in Figure 9.1.14.2-2, solar energy facilities within the SEZ could be visible from a very small portion of the WA. Portions of the WA within the 650-ft (198.1-m) viewshed (approximately 762 acres [3.08 km^2], or 2.9% of the total WA acreage) extend from the point of closest approach at the northwest corner of the SEZ to approximately 22.5 mi (36.2 km) from the SEZ. Portions of the WA within the 24.6-ft (7.5-m) viewshed encompass approximately 342 acres (1.4 km^2) or 1.3% of the total WA acreage.

  The North Algodones Dunes WA is entirely contained within Imperial Sand Dunes Recreation Area and constitutes much of the northern portion of the area. The largest and tallest dunes are on the west side of the WA, while the east side contains smaller, secondary dunes.

  Figure 9.1.14.2-3 is a three-dimensional Google Earth™ perspective visualization of the SEZ (highlighted in orange) as seen from one of the higher dunes (elevated approximately 300 ft [91.4 m] above the SEZ) on the west side of the WA, and approximately 21 mi (34 km) from the northeastern boundary of the SEZ. The visualization includes two simplified wireframe

FIGURE 9.1.14.2-3 Google Earth Visualization of the Proposed Imperial East SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from the North Algodones Dunes WA/ACEC

models of a hypothetical solar power tower facility. The models were placed within the SEZ as a visual aide for assessing the approximate size and viewing angle of utility-scale solar facilities. The receiver towers depicted in the visualization are properly scaled models of a 459-ft (139.9-m) power tower with an 867-acre (3.5-km^2) field of 12-ft (3.7-m) heliostats, each representing approximately 100 MW of electric generating capacity. In the visualization, the SEZ area is depicted in orange, the heliostat fields in blue.

Looking south at the SEZ from one of the higher dunes (elevated approximately 300 ft [91.4 m] above the SEZ) on the west side of the WA, the visualization suggests that the upper portions of sufficiently tall power towers and other tall solar facility components (e.g., transmission towers and plumes located within the SEZ) could be visible from the higher dunes in the WA, and that lower height solar collector arrays might also be visible, in the absence of screening vegetation or structures. The SEZ is far enough from the WA, and the angle of view is low enough, however, that any visible solar collector arrays would be barely visible over the horizon and would appear as a very thin horizontal band that would repeat the strong horizon line. At the long distance between the WA and the SEZ, the SEZ would occupy a very small part of the field of view. Visible operating power tower receivers within the SEZ would appear as distant points of light on the southern horizon. If sufficiently tall, power towers could have red or white flashing hazard navigation lights that could be visible for long distances at night, and could potentially be seen from this viewpoint, although there would be numerous other lights visible in the vicinity of the SEZ. Under the development scenario analyzed in this PEIS, solar energy development within the SEZ would be expected to cause minimal visual impacts on the North Algodones Dunes WA.

National Historic Trail

- *Juan Bautista de Anza*—The Juan Bautista de Anza National Historic Trail is a congressionally designated multistate and two-country historic trail that passes within approximately 10 mi (18 km) of the SEZ at the point of closest approach on the south side of the SEZ, located in Mexico. As shown in Figure 9.1.14.2-2, within the United States, the eastern portion of the trail is 18 mi (30 km) east of the SEZ at the point of closest approach. The western portion of the trail in the United States is located 20 mi (33 km) west of the SEZ. Portions of the western portion of the historic trail in the United States are within the 650-ft (198.1-m) viewshed, extending from the point of closest approach at the western boundary of the SEZ to approximately 24 mi (39 km) from the SEZ. The historic trail is not within the lower-height viewsheds, except for a roughly 0.5-mi (0.8-km) segment approximately 20 mi (32 km) east of the SEZ.

The area of intermittent visibility east of the SEZ is within and around the Pilot Knob ACEC (see discussion below). In the absence of vegetative or other screening, the SEZ and solar development within the SEZ could be visible on the western horizon from the highest ridges and west-facing slopes in the Pilot Knob area, but the SEZ would occupy a very small portion of the field of view. If visible at the long distance between Pilot Knob and the SEZ, operating power tower receivers located within the SEZ would appear as distant lights on the horizon, viewed against the background of the In-Ko-Pah Mountains. If sufficiently tall, power towers could have red or white flashing hazard navigation lights that could be visible for long distances at night, and could potentially be seen from this viewpoint, although there would be numerous other lights visible in the vicinity of the SEZ. Expected visual impacts on trail users would be minimal.

In Yuma, Arizona, the trail splits into the historic route and the auto route. The historic trail goes southwest into Baja California, Mexico, for approximately 55 mi (89 km) and then turns north back into California. Because of the lack of accurate elevation data and uncertainty about the exact location of the historic trail in Mexico, accurate GIS-based viewshed analyses for the trail in Mexico were not performed. In Mexico, the trail is approximately 12 mi (19 km) south of the SEZ and runs generally east–west through agricultural lands. The elevation gradually decreases south of the SEZ; thus it is likely that the SEZ is visible from nearby locations in Mexico, but a large area of agricultural lands is located about 6 mi (10 km) south of the SEZ in Mexico that may screen views of the SEZ. Absent vegetative or other screening, because the elevation is lower than the SEZ, low-height solar facilities would not likely be visible; however, taller structures might be visible. When operating, sufficiently tall power tower receivers within the SEZ might be visible as points of light on the northern horizon. If sufficiently tall, power towers could have red or white flashing hazard navigation lights that could be visible for long distances at night. Unless there was screening present, they could potentially be seen from the trail, although there would be other lights visible in the vicinity of the SEZ.

Approximately 19 mi (31 km) west of the SEZ, the national historic trail re-enters the United States in an agricultural area but at an elevation approximately 70 to 80 ft (21 to 24 m) lower than the western boundary of the SEZ. Within the 25-mi (40-km) viewshed of the SEZ, the trail west of the SEZ is only visible in the 650-ft (198.1-m) viewshed, indicating that if solar development within the SEZ were not screened by vegetation or structures between the trail and the SEZ, only the upper portions of taller operating power towers within the SEZ would be visible as distant lights on the horizon. As above, flashing red or white hazard navigation lights on power towers could potentially be visible at night. At the long distance to the SEZ, and very low viewing angle, impacts from solar development within the SEZ on views from the trail would be minimal.

As noted previously, while the historic trail route passes through Mexico in the close vicinity of the SEZ, the auto route stays in California. It follows I-8 from Yuma to State Route 98, where it crosses the SEZ, paralleling the southern boundary of the SEZ. In Calexico, west of the SEZ, the auto route travels north on State Route 111.

Traveling along the auto route from the east, the trail auto route enters the 25-mi (40-km) SEZ viewshed near the Imperial Sand Dunes, approximately 20 mi (32 km) east of the SEZ. At this point, in the absence of screening by vegetation, the upper portions of sufficiently tall power towers would come into view, likely appearing as distant points of light on the western horizon. In this area, the trail passes through flat lands, with sandy soils and sparse vegetation that would not generally be tall or dense enough to screen views of the SEZ. Traveling west on the auto route, solar facilities in the SEZ would appear in front of travelers, gradually increasing in apparent size.

Figure 9.1.14.2-4 is a Google Earth visualization that depicts a view of the SEZ (highlighted in orange) as seen from a point along State Route 98, within the SEZ. The heliostat field is highlighted in blue.

Where the auto route passes through the SEZ, solar facilities within the SEZ would generally be visible, and facilities located near the roads could strongly attract attention, and would likely dominate views from the roads. Views of East Mesa and surrounding Imperial Valley and Imperial Sand Dunes could be completely or partially screened by solar facilities, depending on the layout of solar facilities within the SEZ. The collector/reflector arrays of solar facilities within the SEZ would be seen edge-on, so they would repeat the line of eth horizon, but could be so close to the roadway that their forms and structural details would be visible, which would increase visual contrast levels.

Taller ancillary facilities, such as buildings, transmission structures, and cooling towers; and plumes (if present) would likely be visible projecting above the collector/reflector arrays, and their structural details could be evident at least for nearby facilities. The ancillary facilities could create form and line contrasts with the strongly horizontal, regular, and repeating forms and lines of the collector/reflector arrays. Color and texture contrasts would also be likely, but their extent would depend on the materials and surface treatments utilized in the facilities.

Under the 80% development scenario analyzed in this PEIS, strong visual contrasts would be expected for viewpoints on the auto route portion or the trail within the SEZ. If solar facilities were located on both sides of the roads, the banks of solar collectors on both sides of the roads could form a visual “tunnel” that travelers would pass through.

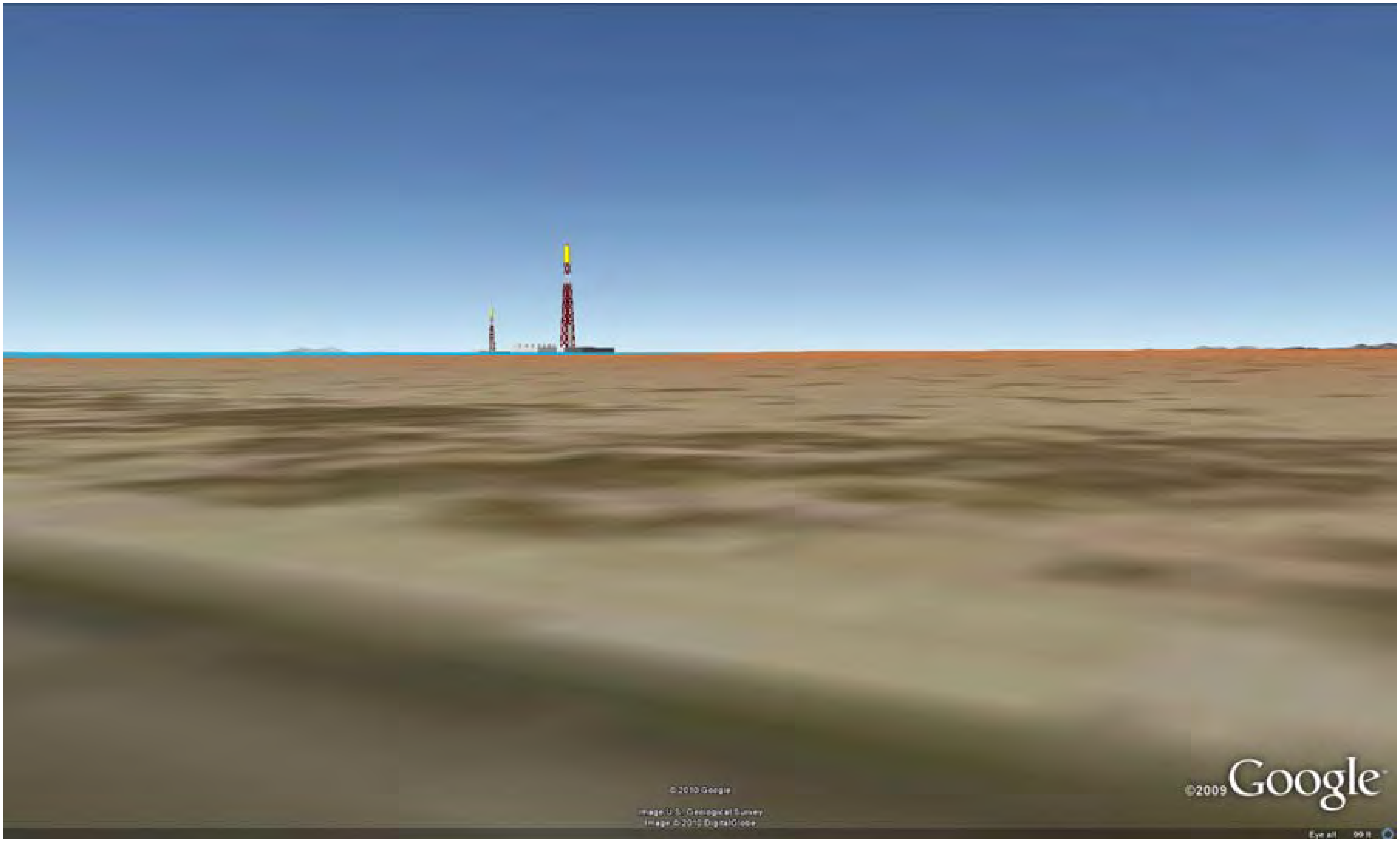

FIGURE 9.1.14.2-4 Google Earth Visualization of the Proposed Imperial East SEZ (shown in orange tint), as Seen from Viewpoint on the Auto Route of the Juan Bautista de Anza Trail within the SEZ

If power tower facilities were located in the SEZ in close proximity to the auto tour route, when operating, the receivers could appear as brilliant light sources as viewed from the road, and if sufficiently close to the road, would likely strongly attract views. Also, during certain times of the day from certain angles, sunlight on dust particles in the air might result in the appearance of light streaming down from the tower(s). If sufficiently tall, power towers could have red or white flashing hazard navigation lights that could be visible for long distances at night, and could be visually conspicuous from this viewpoint. Other lighting associated with solar facilities in the SEZ could be visible as well.

From the west, the auto route of the Juan Bautista de Anza National Historic Trail enters the 25-mi (40-km) SEZ viewshed approximately 23 mi (38 km) northwest of the SEZ, at which point the SEZ would come into view in the absence of screening by vegetation or structures. Solar facilities in the SEZ would gradually increase in apparent size as drivers moved eastward on State Route 98. Where visible, the SEZ would appear just to the left of the center of the field of view looking down the road.

Within the SEZ, the visual experience would be similar to that described above for west-bound travelers, except that most solar facilities would likely be viewed on the left side of west-bound vehicles, as most of the SEZ lands are north of the auto tour route.

National Natural Landmark

- *Imperial Sand Hills*—Imperial Sand Hills National Natural Landmark (NNL) is located approximately 16 mi (25 km) northeast of the SEZ. It is one of the largest masses of sand dunes in the United States and is an outstanding example of dune geology and ecology. Dunes in excess of 500 ft (152.4 m) high are found within the NNL, and the SEZ and solar energy facilities within the SEZ would be visible from the highest dunes within the NNL. If power tower facilities were sited in the SEZ, the receivers could project slightly above the line of the horizon for viewers on high dunes within the NNL, and at the relatively long distance to the SEZ, would appear as distant points of light when operating. If sufficiently tall, power towers could have red or white flashing hazard navigation lights that could be visible from the NNL at night. Potential visual impacts occurring in the landmark arising from solar energy development within the SEZ would depend on the location of the viewer and project location, project technology, site design, and other visibility factors. Under the 80% development scenario analyzed in this PEIS, solar energy development within the SEZ would be expected to cause minimal to weak visual contrasts with the natural-appearing surroundings, as seen from the NNL.

ACEC Designated for Outstanding Scenic Qualities

- *North Algodones Dunes*—The North Algodones Dunes ACEC is a 25,835-acre (104.6-km^2) BLM-designated ACEC that is located north of the Imperial Sand Hills NNL. The ACEC was designated to provide special management for this outstanding scenic area. The ACEC is located approximately 16 mi (25 km) north of the SEZ at the point of closest approach. As shown in Figure 9.1.14.2-2, the area of the ACEC within the viewshed of the SEZ includes the western-most portion of the ACEC and extends east for approximately 2.7 mi (4.3 km).Portions of the ACEC within the 650-ft (198.1-m) viewshed include approximately 745 acres (3.0 km^2), or 2.9% of the total ACEC acreage. Portions of the ACEC within the 24.6-ft (7.5-m) viewshed include approximately 346 acres (1.4 km^2), or 1.3% of the total ACEC acreage.

  The North Algodones Dunes ACEC is entirely contained within the North Algodones Dunes WA and constitutes nearly the same area as the WA. Potential impacts on the ACEC from solar energy development within the SEZ are the same as those described for the WA (discussed above).

Impacts on Selected Other Federal Lands and Resources

- *Plank Road*—The 298-acre (1.2-km^2) Plank Road ACEC has been designated by the BLM as a unique historic road. The ACEC is located within the Imperial Sand Dunes Recreation Area and is located about 10 mi (16 km) from the southeastern corner of the SEZ, at the point of closest approach. The area of the ACEC within the 650-ft (198.1-m) viewshed of the SEZ includes 26 acres (0.1 km^2), or 8.8% of the total ACEC acreage. The area within the 24.6-ft (7.5-m) viewshed of the SEZ includes 16 acres (0.07 km^2), or 5.2% of the total SRMA acreage.

  The elevation within the ACEC is approximately 80 to 100 ft (24 to 30 m) higher than the SEZ. The area between the ACEC and the SEZ has few cultural disturbances visible except unpaved roads and fences. Solar collector arrays and other low-height components of solar facilities within the SEZ would be barely visible and would be viewed edge-on, so they would tend to repeat the strong horizontal line of the plain in which the ACEC and the SEZ are located, which would reduce visual contrast. Less reflective objects, such as PV panel arrays, might be difficult to distinguish against the background. Power towers, transmission towers, other power block facilities, and plumes could be visible above the collector arrays. If sufficiently tall, power towers could have red or white flashing hazard navigation lights that could be visible from the ACEC at night. Under the development scenario analyzed in this PEIS, solar energy facilities located within the SEZ would be expected to create minimal to weak visual contrasts, as seen from the ACEC.

- *Pilot Knob*—The 869-acre (3.5-km^2) Pilot Knob ACEC was designated for its prehistoric and Native American values. In addition to its Native American values and the Fort Yuma Indian Reservation bordering its public lands, the Pilot Knob ACEC was used by General Patton in training troops for combat in World War II (WWII). As shown in Figure 9.1.14.2-2, the ACEC is located approximately 20 mi (31 km) from the nearest eastern edge of the SEZ, at the point of closest approach. The area of the ACEC within the 650-ft (198.1-m) viewshed of the SEZ includes 37 acres (0.2 km^2). The area within the 24.6-ft (7.5-m) viewshed of the SEZ includes 6 acres (0.02 km^2), or 0.6% of the total ACEC acreage.

  As noted above (under discussion of impacts on Juan Bautista de Anza National Historic Trail), there is an area of intermittent SEZ visibility within and around the Pilot Knob ACEC. In the absence of vegetative or other screening, the SEZ and solar development within the SEZ could be visible on the western horizon from the highest ridges and west-facing slopes in the Pilot Knob area, but would occupy a very small portion of the field of view. Even at the higher elevations, the angle of view is low enough that the tops of solar collector arrays would not likely be visible, and the arrays, if visible at all, would repeat the line of the plain in which the SEZ is located. If power tower receivers located within the SEZ were visible at the long distance between Pilot Knob and the SEZ, when operating, they would appear as distant lights on the horizon, viewed against the background of the In-Ko-Pah Mountains. If sufficiently tall, power towers could have red or white flashing hazard navigation lights that could be visible from the ACEC. Expected visual impacts on trail users would be minimal.

Additional scenic resources exist at the national, state, and local levels, and impacts on both federal and nonfederal lands may occur, including sensitive traditional cultural properties important to Tribes. Note that in addition to the resource types and specific resources analyzed in this PEIS, future site-specific NEPA analyses would include state and local parks, recreation areas, other sensitive visual resources, and communities close enough to the proposed project to be affected by visual impacts. Selected other lands and resources are included in the discussion below.

In addition to impacts associated with the solar energy facilities themselves, sensitive visual resources could be affected by facilities that would be built and operated in conjunction with the solar facilities. With respect to visual impacts, the most important associated facilities would be access roads and transmission lines, the precise location of which cannot be determined until a specific solar energy project is proposed. For this analysis, the impacts of construction and operation of transmission lines outside of the SEZ were not assessed, assuming that the existing 115-kV transmission line might be used to connect some new solar facilities to load centers, and that additional project-specific analysis would be done for new transmission construction or line upgrades. However, transmission lines to connect facilities to the existing line would be required. Note that depending on project- and site-specific conditions, visual impacts associated with access roads, and particularly transmission lines, could be large.

Detailed information about visual impacts associated with transmission lines is presented in Section 5.7.1. A detailed site-specific NEPA analysis would be required to precisely determine visibility and associated impacts for any future solar projects, based on more precise knowledge of facility location and characteristics.

Impacts on Selected Other Lands and Resources

Route 78-Anza Borrego Desert State Park Road. Approximately 7 mi (1 km) of Route 78-Anza Borrego Desert State Park Road is within the northwestern portion of the viewshed of the Imperial East SEZ. The visible portion of the trail within the 25-mi (40 km) limit of analysis for visual impacts is within 21 mi (34 km) of the SEZ. Since both the SEZ and the road in this area are in low-lying areas, the angle of view between them is low, and at the very long distance between them, minimal visual impacts on State Route 78 users would be expected.

I-8 and State Route 98. As noted above (under discussion of impacts on Juan Bautista de Anza Historic Trail auto tour route), State Route 98, a two-lane highway, passes through the southern portion of the Imperial East SEZ. It is also the auto tour portion of the Juan Bautista de Anza National Historic Trail. The annual average daily traffic (AADT) value for State Route 98 in the vicinity of the SEZ is 1,900 to 2,500 vehicles. I-8 is a two-lane interstate highway that follows the northern boundary of the SEZ. The AADT value for I-8 in the vicinity of the SEZ is 11,200 to 14,000 vehicles. Under the PEIS development scenario, travelers on both roadways could be subject to large visual impacts from solar energy development within the SEZ; however, because of the relatively small size of the SEZ and high travel speed for the two roads, the duration of these impacts would normally be brief, generally not exceeding 8 minutes per trip.

Solar facilities within the SEZ could be in full view from both roads, and facilities located near the roads would likely strongly attract visual attention and could dominate views from the roads. On State Route 98, views of East Mesa and surrounding Imperial Valley and Imperial Sand Dunes could be completely or partially screened by solar facilities, depending on the layout of solar facilities within the SEZ. Because State Route 98 passes through the SEZ, solar facilities within the SEZ could create strong visual contrasts for travelers, depending on solar project characteristics and location within the SEZ. If solar facilities were located on both sides of State Route 98, banks of solar collectors on both sides of the road could form a visual "tunnel" that travelers would pass through.

If operating power tower facilities were located in the SEZ in close proximity to the roads, the receivers could appear as brilliant light sources as viewed from the roads, and if sufficiently close to the roads would likely strongly attract views. Also, during certain times of the day from certain angles, sunlight on dust particles in the air might result in the appearance of light streaming down from the tower.

As travelers approached and passed through the SEZ, depending on lighting conditions, the solar technologies present, facility layout, and mitigation measures employed, there would be the potential for significant levels of glint and glare from reflective surfaces. These effects could potentially distract drivers and/or impair views toward the facilities. These potential impacts could be reduced by siting reflective components away from the roads, employing various screening mechanisms, and/or adjusting the mirror operations to reduce potential impacts.

Communities of Holtville, Calexico, Heber, El Centro, and Imperial. As shown in Figure 9.1.14.2-2, the viewshed analyses indicate visibility of the SEZ from the communities of Holtville (approximately 10 mi [16 km] northwest of the SEZ), Calexico (approximately 16 mi [26 km] southwest of the SEZ), Heber (approximately 18 mi [29 km] west of the SEZ), El Centro (approximately 20 mi [33 km] northwest of the SEZ) and Imperial (approximately 21 mi [34 km] northwest of the SEZ). A detailed future site-specific NEPA analysis is required to determine visibility precisely; however, given the flatness of the area and the relatively long distances to these communities from the SEZ, visual impacts from solar energy facilities within the SEZ would be expected to be minimal. All of these communities are lower in elevation than the SEZ. Because of the long distance and very low angle of view, visibility of solar facilities within the SEZs from any of these communities except Holtville, is very doubtful. Visibility from Holtville is unlikely, except that sufficiently tall power towers, transmission towers, plumes, and other tall solar facility components might be visible above the horizon but not likely conspicuous. Where visibility existed, it would be limited to the outskirts of these communities in the direction of the SEZ, because structures and vegetation within the urban areas would screen views of the SEZ from most of the communities.

Other Impacts. In addition to the impacts described for the resource areas above, nearby residents and visitors to the area may experience visual impacts from solar energy facilities located within the SEZ (as well as any associated access roads and transmission lines) from their residences, or as they travel area roads. The range of impacts experienced would be highly dependent on viewer location, project types, locations, sizes, and layouts, as well as the presence of screening, but under the 80% development scenario analyzed in the PEIS, from some locations, strong visual contrasts from solar development within the SEZ could potentially be observed.

9.1.14.2.3 Summary of Visual Resource Impacts for the Proposed Imperial East SEZ

Under the 80% development scenario analyzed in this PEIS, there could be multiple solar facilities within the Imperial East SEZ, a variety of technologies employed, and a range of supporting facilities that would contribute to visual impacts, such as transmission towers and lines, substations, power block components, and roads. The resulting visually complex landscape would be essentially industrial in appearance and would contrast strongly with the surrounding mostly natural-appearing landscape. Large visual impacts on the SEZ and surrounding lands within the SEZ viewshed would be associated with solar energy development within the SEZ because of major modification of the character of the existing landscape. Additional impacts could occur from construction and operation of transmission lines and access roads within and/or outside the SEZ.

The SEZ is in an area of low scenic quality, with numerous cultural disturbances already present. Residents, workers, and visitors to the area may experience visual impacts from solar energy facilities located within the SEZ (as well as any associated access roads and transmission lines) as they travel area roads. The residents nearest to the SEZ could be subjected to large visual impacts from solar energy development within the SEZ.

Utility-scale solar energy development within the proposed Imperial East SEZ is unlikely to cause even moderate visual impacts on highly sensitive visual resource areas, the closest of which is more than 15 mi (24 km) from the SEZ. The closest community is beyond 10 mi (16 km) from the SEZ and is likely to experience minimal visual impacts from solar development within the SEZ.

9.1.14.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features have been identified to protect visual resources for the proposed Imperial East SEZ. As noted in Section 5.12, the presence and operation of large-scale solar energy facilities and equipment would introduce major visual changes into nonindustrialized landscapes and could create strong visual contrasts in line, form, color, and texture that could not easily be mitigated substantially. Implementation of the programmatic design features that are presented in Appendix A, Section A.2.2, would reduce the magnitude of visual impacts experienced; however, the degree of effectiveness of these design features could be assessed only at the site- and project-specific assessment level. Given the large-scale, reflective surfaces and strong regular geometry of utility-scale solar energy facilities and the typical lack of screening vegetation and landforms within the SEZ viewshed, siting the facilities away from sensitive visual resource areas and other sensitive viewing areas is the primary means of mitigating visual impacts. The effectiveness of other visual impact mitigation measures would generally be limited.

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9.1.15 Acoustic Environment

9.1.15.1 Affected Environment

The proposed Imperial East SEZ is located in south central Imperial County in the southeastern corner of California. Imperial County has established noise standards (ICPDS undated). Noise standards applicable to solar energy development include the property-line noise standards: 50 dBA daytime (7 a.m. to 10 p.m.) L_{eq} and 45 dBA nighttime (10 p.m. to 7 a.m.) L_{eq} for residential zones. In addition, the construction noise limit has been established at 75 dBA L_{eq} at the nearest sensitive receptor, and construction equipment operation is limited to 7 a.m. to 7 p.m., Monday through Friday, and 9 a.m. to 5 p.m. Saturday.

I-8 runs east–west along the northeast edge of the proposed Imperial East SEZ, while State Route 98, a two-lane highway, passes through the southern edge. About 0.25 mi (0.4 km) to the south of the SEZ lies the All-American Canal, along which two hydroelectric power plants are located. Several geothermal facilities and development projects are located to the northwest within 5 mi (8 km) from the proposed SEZ. Large-scale irrigated agricultural activities occur about 2.5 mi (4 km) to the west and 6 mi (10 km) in Mexico to the south of the SEZ. The Mexicali Airport in Mexico and Holtville Airport are about 5 to 6 mi (8 to 10 km) southwest and north–northwest of the SEZ, respectively. Therefore, noise sources around the SEZ include road traffic from I-8 and State Route 98, industrial noise from hydroelectric power plants and geothermal facilities, agricultural activities, noise from activities and events at nearby communities and aircraft flyover including military/commercial/private airplanes, crop dusters, and border patrol helicopters. No sensitive receptors (e.g., hospitals, schools, or nursing homes) exist around the SEZ. The nearest noise receptor lies in a cluster of employee residences of the IID, which are located about 500 ft (150 m) south of the southwestern corner of the SEZ. Temporary residences including a small Tamarisk long-term visitor area, is located just south of the SEZ and north of the All-American Canal. The next nearest residences are located about 2.7 mi (4.3 km) west of the northwestern corner of the SEZ along the East Highline Canal. The nearest population center with schools or town infrastructure is Holtville, located about 10 mi (16 km) northwest of the SEZ. Background noise levels would be relatively high along the north and south SEZ boundary, while noise levels in the central portion of the SEZ would be relatively low. To date, no environmental noise survey has been conducted around the Imperial East SEZ. On the basis of the population density in Imperial County, the day-night average sound level (L_{dn} or DNL) is estimated to be 37 dBA for Imperial County, typical of a rural area (Eldred 1982; Miller 2002). However, maximum noise levels in the SEZ would be about 75 and 65 dBA L_{dn} along I-8 and State Route 98, respectively (ICPDS undated), and thus noise levels within the SEZ are estimated to be about 50 dBA L_{dn}[13] or slightly higher.

[13] Typically, the nighttime level is 10 dBA lower than the daytime level, and it can be interpreted as 50 dBA during daytime hours and 40 dBA during nighttime hours.

9.1.15.2 Impacts

Potential noise impacts associated with solar projects in the Imperial East SEZ would occur during all phases of the projects. During the construction phase, potential noise impacts associated with operation of heavy equipment and vehicular traffic on nearby residences (within 500 ft [150 m]) would be anticipated, albeit of short duration. During the operations phase, potential impacts on nearby residences would be anticipated, depending on the solar technologies employed. Noise impacts shared by all solar technologies are discussed in detail in Section 5.13.1, and technology-specific impacts are presented in Section 5.13.2. Impacts specific to the Imperial East SEZ are presented in this section. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through any additional SEZ-specific design features applied (see Section 9.1.15.3 below). This section primarily addresses potential noise impacts on humans, although potential impacts on wildlife and/or visitors at nearby sensitive areas are discussed, Additional discussion on potential noise impacts on wildlife is presented in Section 5.10.2.

9.1.15.2.1 Construction

The proposed Imperial East SEZ has a relatively flat terrain; thus, minimal site preparation activities would be required, and associated noise levels would be lower than those during general construction (e.g., erecting building structures and installing equipment, piping, and electrical). Solar array construction would also generate noise, but it would be spread over a wide area.

For the parabolic trough and power tower technologies, the highest construction noise levels would occur at the power block area; a maximum of 95 dBA at a distance of 50 ft (15 m) is assumed, if impact equipment such as pile drivers or rock drills is not being used. Typically, the power block area is located in the center of the solar facility, at a distance of more than 0.5 mi (0.8 km) to the facility boundary. However, noise levels from construction of the solar array would be lower than 95 dBA. When geometric spreading and ground effects are taken into consideration, as explained in Section 4.13.1, noise levels would attenuate to about 50 dBA at a distance of 0.5 mi (0.8 km) from the power block area, which is assumed to be at or near the facility boundary. This noise level is the same as an estimated daytime background level. In addition, mid- and high-frequency noise from construction activities is significantly attenuated by atmospheric absorption under the low-humidity conditions typical of an arid desert environment, and by temperature lapse conditions typical of daytime hours; thus noise attenuation to background levels would occur at distances somewhat shorter than 0.5 mi (0.8 km). If a 10-hour daytime work schedule is considered, the EPA guideline level of 55 dBA L_{dn} for residential areas (EPA 1974) would occur at about 1,200 ft (370 m) from the power block area, which would be well within the facility boundary. For construction activities occurring near the residences closest to the southwestern SEZ boundary, estimated noise levels at the nearest residences would be about 69 dBA, which is well above an estimated background level of 50 dBA but below the Imperial County regulation of 75 dBA L_{eq} for construction noise. In addition, an estimated 65 dBA L_{dn}[14] at this location is well above the EPA guideline of 55 dBA L_{dn} for residential areas. However, noise levels at this location would be lower than these values, because these residences are located upwind of prevailing winds, which creates a shadow zone (to be discussed later).

There are three specially designated areas near the SEZ (Lake Cahuilla ACECs C and D, and East Mesa ACEC) within 5-mi (8-km) of the Imperial East SEZ, which is the farthest distance that noise (except extremely loud noise) would be discernable. However, these ACECs are not noise-sensitive areas (i.e., they were designed as ACECs because they could contain significant cultural resources), and thus no noise impact analysis for these ACECs was conducted.

Depending on the soil conditions, pile driving might be required for installation of solar dish engines. However, the pile drivers used would be relatively small and quiet, such as vibratory or sonic drivers, rather than the impulsive impact pile drivers frequently seen at large-scale construction sites. Potential impacts on the nearest residences (more than 500 ft [150 m] from the SEZ boundary) would be anticipated to be minor, except when pile driving occurs near the southwestern corner of the SEZ.

It is assumed that most construction activities would occur during the day, when noise is better tolerated than at night, because of the masking effects of background noise. In addition, construction activities for a utility-scale facility are temporary in nature (typically a few years). Construction would cause some unavoidable but localized short-term impacts on neighboring residences, particularly for activities occurring near the southwestern proposed SEZ boundary, close to the nearby residences.

Construction activities could result in various degrees of ground vibration, depending on the equipment used and construction methods employed. All construction equipment causes ground vibration to some degree, but activities that typically generate the most severe vibrations are high-explosive detonations and impact pile driving. As for noise, vibration would diminish in strength with distance. For example, vibration levels at receptors beyond 140 ft (43 m) from a large bulldozer (87 VdB at 25 ft [7.6 m]) would diminish below the threshold of perception for humans, which is about 65 VdB (Hanson et al. 2006). During the construction phase, no major construction equipment that can cause ground vibration would be used, and no residences or sensitive structures are located in close proximity. Therefore, no adverse vibration impacts are anticipated from construction activities, including from pile driving for dish engines.

For this analysis, the impacts of construction and operation of transmission lines outside of the SEZ were not assessed, assuming that the existing 115-kV transmission line might be used to connect some new solar facilities to load centers, and that additional project-specific analysis would be done for new transmission construction or line upgrades. However, some construction of transmission lines could occur within the SEZ. Potential noise impacts on nearby residences

[14] For this analysis, background levels of 50 and 40 dBA for daytime and nighttime hours, respectively, are assumed, which result in day-night average noise level (L_{dn}) of 50 dBA.

would be a minor component of construction impacts in comparison with solar facility construction and would be temporary in nature.

9.1.15.2.2 Operations

Noise sources common to all or most types of solar technologies include equipment motion from solar tracking; maintenance and repair activities (e.g., washing of mirrors or replacement of broken mirrors) at the solar array area; commuter/visitor/support/delivery traffic within and around the solar facility; and control/administrative buildings, warehouses, and other auxiliary buildings/structures. Diesel-fired emergency power generators and fire water pump engines would be additional sources of noise, but their operations would be limited to several hours per month (for preventive maintenance testing).

With respect to the main solar energy technologies, noise-generating activities in the PV solar array area would be minimal, related mainly to solar tracking, if used. Dish engine technology, which employs collector and converter devices in a single unit, on the other hand, generally has the strongest noise sources.

For the parabolic trough and power tower technologies, most noise sources during operations would come from the power block area, including the turbine generator (typically in an enclosure), pumps, boilers, and dry or wet-cooling systems. The power block is typically located in the center of the facility. On the basis of a 250-MW parabolic trough facility with a cooling tower (Beacon Solar, LLC 2008), simple noise modeling indicates that noise levels around the power block would be more than 85 dBA, but about 52 dBA at the facility boundary, about 0.5 mi (0.8 km)from the power block area. For a facility located near the southwestern corner of the SEZ, the predicted noise level would be about 50 dBA at the nearest residences about 500 ft (150 m) from the SEZ boundary, which is the same as estimated background level and the Imperial County regulation of 50 dBA daytime L_{eq}. Such noise from a solar facility could be discernable at the residences depending on meteorological conditions. If thermal energy storage (TES) were not used (i.e., if the operation were limited to daytime, 12 hours only[15]), the EPA guideline level of 55 dBA (as L_{dn} for residential areas) would occur at about 1,370 ft (420 m) from the power block area and thus would not be exceeded outside of the proposed SEZ boundary. At the nearest residences, about 52 dBA as L_{dn} is estimated, which is below the EPA guideline level. However, if TES were used during nighttime hours, day-night average sound levels higher than those estimated above would be anticipated, as explained below and in Section 4.13.1.

On a calm, clear night typical of the proposed Imperial East SEZ setting, the air temperature would likely increase with height (temperature inversion) because of strong radiative cooling. Such a temperature profile tends to focus noise downward toward the ground. Thus, there would be little, if any, shadow zone[16] within 1 or 2 mi (2 or 3 km) of the noise

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[15] Maximum possible operating hours at the summer solstice, but limited to 7 to 8 hours at the winter solstice.

[16] A shadow zone is defined as the region where direct sound does not penetrate because of upward diffraction.

source in the presence of a strong temperature inversion (Beranek 1988). In particular, such conditions add to the effect of noise being more discernable during nighttime hours, when the background levels are the lowest. To estimate the day-night average sound level (L_{dn}), 6-hour nighttime generation with TES is assumed after 12-hour daytime generation. For nighttime hours under temperature inversion, 10 dB is added to sound levels estimated from the uniform atmosphere (see Section 4.13.1). On the basis of these assumptions, the estimated sound level at the nearest residences (about 0.6 mi [1.0 km] from the power block area for a solar facility located near the southwestern SEZ boundary) would be 60 dBA L_{eq}, which is higher than the Imperial County regulation of 45 dBA nighttime L_{eq}. The combined day/night noise is estimated to be about 61 dBA as L_{dn}, which is higher than the EPA guideline of 55 dBA for residential areas. The assumptions are conservative in terms of operating hours, and no credit was given to other attenuation mechanisms; thus it is likely that sound levels would be lower than 61 dBA at the nearest residences, even if TES were used at a solar facility. Operating parabolic trough or power tower facilities using TES and located near the southwestern SEZ boundary could result in noise levels above background levels and corresponding adverse noise impacts on the nearest residences. In the permitting process, refined noise propagation modeling would be warranted along with measurement of background sound levels.

The solar dish engine is unique among concentrating solar power (CSP) technologies, because it generates electricity directly and does not require a power block. A single, large solar dish engine has relatively low noise levels, but a solar facility might employ tens of thousands of dish engines, which would cause high noise levels around such a facility. For example, the proposed 750-MW SES Solar Two dish engine facility in California would employ as many as 30,000 dish engines (SES Solar Two, LLC 2008). At the Imperial East SEZ, assuming a dish engine facility of up to 509 MW covering 80% of the total area (4,578 acres [19 km^2]), up to 20,360 25-kW dish engines could be employed. Also, for a large dish engine facility, several hundred step-up transformers would be embedded in the dish engine solar field, along with several substations; the noise from these sources, however, would be masked by dish engine noise.

The composite noise level of a single dish engine would be about 89 dBA at a distance of 3 ft (0.9 m) (SES Solar Two, LLC 2008). This noise level would be attenuated to about 40 dBA (typical of the mean rural daytime environment) within 340 ft (105 m). However, the combined noise level from tens of thousands of dish engines operating simultaneously would be high in the immediate vicinity of the facility, for example, about 49 dBA at 1.0 mi (1.6 km) and 45 dBA at 2 mi (3 km) from the boundary of the square-shaped dish engine solar field; both values are lower than the daytime Imperial County regulation of 50 dBA. These levels would occur at somewhat shorter distances than the aforementioned distances, considering noise attenuation by atmospheric absorption and temperature lapse during daytime hours. To estimate noise levels at the nearest residences, it was assumed that dish engines were placed all over the Imperial East SEZ at intervals of 98 ft (30 m). Under these assumptions, the estimated noise levels at the nearest residences (500 ft [150 m] from the SEZ boundary) would be about 54 dBA, which is somewhat higher than the daytime Imperial County regulation of 50 dBA. On the basis of 12-hour daytime operation, the estimated 54 dBA L_{dn} at these residences is just below the EPA guideline of 55 dBA L_{dn} for residential areas. Considering other attenuation mechanisms and upwind location of prevailing winds, noise levels at the nearest residences would be lower than the values estimated above. Noise from dish engines could cause adverse impacts on the nearest residences, depending on background noise levels and meteorological conditions. Thus, consideration of minimizing noise impacts is very important during the siting of dish engine facilities. Direct mitigation of dish engine noise through noise control engineering could also limit noise impacts.

During operations, no major ground-vibrating equipment would be used. In addition, no sensitive structures are located close enough to the Imperial East SEZ to experience physical damage. Therefore, potential vibration impacts on surrounding communities and vibration-sensitive structures during operation of any solar facility would be minimal.

Transformer-generated humming noise and switchyard impulsive noises would be generated during the operation of solar facilities. These noise sources would be located near the power block area, typically near the center of a solar facility. Noise from these sources would generally be limited within the facility boundary and rarely be heard at nearby residences, assuming a 0.6-mi (1.0-km) distance (at least 0.5 mi [0.8 km] to the facility boundary and another 500 ft [150 m] to the nearby residences). Accordingly, potential impacts of these noise sources on nearby residences would be minimal.

For this analysis, the impacts of construction and operation of transmission lines outside of the SEZ were not assessed, assuming that the existing 115-kV transmission line might be used to connect some new solar facilities to load centers, and that additional project-specific analysis would be done for new transmission construction or line upgrades. However, some construction of transmission lines within the SEZ could occur. For impacts from transmission line corona discharge noise during rainfall events (discussed in Section 5.13.1.5), the noise level at 50 ft (15 m) and 300 ft (91 m) from the center of a 230-kV transmission line towers would be about 39 and 31 dBA (Lee et al. 1996), respectively, typical of daytime and nighttime mean background levels in rural environments. Corona noise includes high-frequency components and is considered to be more annoying than low-frequency environmental noise. However, corona noise would not likely cause impacts, unless a residence was located close to it (e.g., within 500 ft [152 m] of a 230-kV transmission line). The Imperial East SEZ is located in an arid desert environment, and incidents of corona discharge are infrequent. Therefore, potential impacts on nearby residents from corona noise along the transmission line ROW would be negligible.

9.1.15.2.3 Decommissioning/Reclamation

Decommissioning/reclamation requires many of the same procedures and equipment used in traditional construction. Decommissioning/reclamation would include dismantling of solar facilities and support facilities such as buildings/structures and mechanical/electrical installations, disposal of debris, grading, and revegetation as needed. Activities for decommissioning would be similar to those used for construction but on a more limited scale. Potential noise impacts on surrounding communities would be correspondingly lower than those for construction activities. Decommissioning activities would be of short duration, and their potential impacts would be minor and temporary in nature. The same mitigation measures adopted during the construction phase could also be implemented during the decommissioning phase.

Similarly, potential vibration impacts on surrounding communities and vibration-sensitive structures during decommissioning of any solar facility would be lower than those during construction and thus minimal.

9.1.15.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A, Section A.2.2, would greatly reduce or eliminate the potential for noise impacts from development and operation of solar energy facilities. While some SEZ-specific design features are best established when specific project details are being considered, measures that can be identified at this time include the following:

- Noise levels from cooling systems equipped with TES should be managed so that levels at the nearest residences to the southwest of the SEZ are kept within applicable guidelines. This could be accomplished in several ways, for example, through placing the power block approximately 1 to 2 mi (1.6 to 3 km) or more from residences, limiting operations to a few hours after sunset, and/or installing fan silencers.

- Dish engine facilities within the Imperial East SEZ should be located more than 1 to 2 mi (1.6 to 3 km) from nearby residences located to the southwest of the SEZ (i.e., the facilities should be located in the central or eastern portion of the proposed SEZ). Direct noise control measures applied to individual dish engine systems could also be used to reduce noise impacts at nearby residences.

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9.1.16 Paleontological Resources

9.1.16.1 Affected Environment

The surface geology of the proposed Imperial East SEZ is predominantly composed of thick alluvial deposits (more than 100 ft [30 m] thick) and eolian sediments (loess). Age ranges from Miocene to Holocene suggests depositional environments that could produce fossils. The sub–sea-level basin of the Salton Trough has received a continuous influx of sand, silt, and clay derived from the Colorado River, which created ephemeral lakes in the basin until about 300 years ago. Underlying this alluvial cover is a succession of late Tertiary (Miocene and Pliocene) and Quaternary sediments composed mainly of marine and nonmarine sandstones and clays. The total acreage of the alluvial deposits within the SEZ is 12,310 acres (50 km^2) or 97% of the SEZ. The total acreage of the eolian deposits within the northwestern portion of the SEZ is 324 acres (1 km^2) or 3% of the SEZ. In the absence of a potential fossil yield classification (PFYC) map for the California Desert District, a preliminary classification of PFYC Class 3b is assumed, as there are some documented fossil localities in Imperial County. Class 3b indicates that the potential for the occurrence of significant fossil materials is unknown and needs to be investigated further (see Section 4.8 for a discussion of the PFYC system).

9.1.16.2 Impacts

The potential for impacts on significant paleontological resources at the Imperial East SEZ is unknown. Vertebrate mammalian and invertebrate fossils have been found in deposits of Ancient Lake Cahuilla in the Salton Trough. However, the potential for impacts on significant paleontological resources at the Imperial East SEZ is unknown and a preliminary PFYC of Class 3b has been assigned. A more detailed investigation of the local geological deposits of the SEZ, and their location and potential depth is needed. Once a project area has been chosen, a paleontological survey will likely be needed following consultation with the BLM. The appropriate course of action would be determined as established in BLM IM2008-009 and IM2009-011 (BLM 2007a, 2008a). Section 5.14 discusses the types of impacts that could occur on any significant paleontological resources found to be present within the Imperial East SEZ. Impacts will be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2.

Indirect impacts on paleontological resources outside of the SEZ, such as through looting or vandalism, are unknown. Programmatic design features for controlling water runoff and sedimentation would prevent erosion-related impacts on buried deposits outside of the SEZ.

No new roads or transmission lines have been assessed for the Imperial East SEZ, assuming existing corridors would be used; impacts on paleontological resources related to the creation of new corridors would be evaluated at the project-specific level if new road or transmission construction or line upgrades are to occur.

A programmatic design feature requiring a stop work order in the event of an inadvertent discovery of paleontological resources would reduce impacts by preserving some information and allowing excavation of the resource, if warranted. Depending on the significance of the find, it could also result in some modification to the project footprint. Since the SEZ is located in an area preliminarily classified as PFYC Class 3b, and fossil localities have been found in deposits of Ancient Lake Cahuilla, a stipulation would be included in permitting documents to alert solar energy developers of the possibility of a delay if paleontological resources were uncovered during surface-disturbing activities.

9.1.16.3 SEZ-Specific Design Features and Design Feature Effectiveness

Impacts would be minimized through the implementation of required programmatic design features, including a stop-work stipulation in the event that paleontological resources are encountered during construction, as described in Appendix A, Section A.2.2.

The need for and the nature of any SEZ-specific design features would depend on findings of paleontological surveys.

9.1.17 Cultural Resources

9.1.17.1 Affected Environment

9.1.17.1.1 Prehistory

Human settlement in the Colorado Desert region extends back roughly 10,000 years. While a considerable amount of information has been collected for the Baja Region, more archaeological research has taken place on coastal areas rather than inland areas because of the higher density of development on the coast. The lack of evidence on the interior is also attributable to the instability of the landforms in the Salton Basin and the highly mobile settlement strategies of early populations (Schaefer and Laylander 2007). Evidence of past activities in the project area is primarily associated with Lake Cahuilla. This lake was formed by the periodic overflowing of the Colorado River into the Salton Basin. The lake would form every 100 to 150 years (Redlands Institute 2002). Most archaeological material found in the Salton Basin is associated with the later incarnations of Lake Cahuilla dating to the last 2000 years.

The oldest evidence for people in the Baja Peninsula region is associated with the San Dieguito Complex (10,000 B.C.–5,000 B.C.). People from this culture appear to have lived primarily along the coast, although some sites have been found inland. Artifacts attributed to this culture include large stone tools that are only worked on one side (unifacial worked stone), stones where flakes were removed in a single direction (unidirectional flake cores), and massive bifacial tools. Tools were made from numerous types of stone. People from this culture appear to have relied on hunting for their main food supply, stopping in any location for short periods of time only (Berryman and Cheever 2001). No solid evidence of the San Dieguito Complex sites has been found in the Salton Basin (Doyle et al. 2003).

The Archaic Period (5,000 B.C.–A.D. 500) represents a transition to a subsistence strategy that relies on a more intensive use of local resources. This time period is characterized by an expansion into locations away from the coast and a growing reliance on vegetation for food; however, hunting still remains a major portion of the diet. Artifacts associated with the Archaic period include well-made projectile points, knives and scrapers, and grinding stones. The projectile points are large and were used on spears. Sites from this time period are found near the margins of old watercourses and dry lakeshores. Very little evidence for this complex is found in the Salton Basin. Evidence for the Archaic Period is found in rock shelters on the edges of the Colorado Desert. Sites dating to this complex are likely either buried under alluvium or have been destroyed by agricultural development (Schaefer 1994).

Use of the Salton Basin during prehistoric times varied depending largely on the presence or absence of Lake Cahuilla. When the lake was present, it was exploited as a source for fish and plants that would grow on the lake margins. During periods when the lake was not present, an obsidian source known as Obsidian Butte, which is near the southern end of the current Salton Sea, was the major source for obsidian in the region (Schaefer and Laylander 2007). Obsidian serves as a key raw material for tool manufacture.

The last prehistoric phase identified for the Salton Basin prior to contact with Europeans is the Patayan Phase (500 A.D.–1500 A.D.). Extensive evidence from the Patayan Phase is found along the shore remnants of prehistoric Lake Cahuilla. Beginning with this phase, the prehistory of the Salton Basin is more fully understood. The Patayan culture appears to have been formed when the Archaic Period people of the region were influenced by the Hohokam cultures to the east along the Gila River. Technology associated with the Patayan culture includes buff ware ceramics, clay figurines and pipes, side-notched projectile points, stone manos, pestles and mortars, traded shell beads, rock art, and geoglyphs (Schaefer 1994). Larger more permanent Patayan settlements appear along the northwestern edge of Lake Cahuilla. Some of these sites include evidence of fish traps. However, sites on the southeastern edge of the lake are more widely distributed and suggest more seasonal usage (Schaefer 1994).

9.1.17.1.2 Ethnohistory

Although of differing linguistic stock, the Native Americans who inhabited the southeastern California deserts when Euro-Americans first arrived shared similar lifeways and broadly similar beliefs, norms, and values (Halmo 2003). The mountains and valleys of their shared environment provided a variety of seasonally available resources. Native American groups harvested these resources following a regular seasonal pattern. They lived in kin-based groups, or lineages, that would join together or split apart depending on the type and the abundance of the resources available. A pattern of seasonal camps combined with semipermanent villages or rancherias emerged. Lineages tended to consider as their own, specific highly productive areas, while the areas between were shared with other lineages of varying ethnicity. Wild plant resources were often managed; stands of plant resources might be pruned, watered, or burned to encourage growth (Lightfoot and Parish 2009). The pattern of seasonal migration to exploit particular resources allowed the groups to adapt to changes in their subsistence base with the arrival of new cultural impulses and populations. Floodplain horticulture, adopted from the Southwest, allowed for semipermanent occupation of river floodplains and lakeshores (Halmo 2003). These gardens became part of the migratory pattern, which continued to take some bands into the highlands to harvest resources available there. Similarly, with the discovery of gold in the nineteenth century and the influx of Euro-American populations in the twentieth century, Native Americans added wage labor in mines, on river boats, and on large irrigated farms to their seasonal rounds (Bean et al. 1978).

The various Native American ethnic groups that inhabited the southeastern California deserts each had an area that they considered their homeland, but the boundaries between these areas were not sharply drawn and fluctuated over time. Travel to hunt, trade, or just visit neighboring groups was common (Kelly and Fowler 1986). The territorial claims of the different ethnic groups overlapped each other. Lineages would sometimes share territory, or one group would invite its neighbors to share an abundant resource (CSRI 2002). A network of often still discernable trails reflects a web of social and trade links that stretched from the Pacific Coast to the Great Plains. As discussed below in Section 9.1.18.1, the Native Americans living in southeastern California tend to view the landscape they inhabit holistically, each part intrinsically and inextricably connected to the whole. In some sense, the network of trails tied the landscape together. Trails thus could have sacred as well as profane aspects.

Many of the ethnic groups that inhabited the Colorado Desert shared a considerable amount of ritual behavior and world view. Common to most was some form of the *kəruk*, an important, often annual ritual in which lineages come together to commemorate those who had passed away since the last commemoration (Luomola 1978). For those whose traditional use area would have included the SEZ, Pilot Knob (*Avikwalal)* was a focal point in a sacred landscape (BOR 1994).

Located at the eastern edge of the Imperial Valley, the proposed Imperial East SEZ lies within an area of cultural transition between the hunting and gathering Kumeyaay bands west of the valley and the floodplain farmers who lived to the east along the banks of the Colorado River. The SEZ lies closest to the Kamia bands of the Kumeyaay who practiced floodplain horticulture along the banks of the New River and the Alamo River. The Kamia interacted with, traded with, and sometimes lived together with lineages from surrounding ethnic groups, including the Quechan and the Cocopah, Yuman-speaking groups living along the Colorado River, other Kumeyaay lineages based in the mountains to the west, and the Cahuilla, who were centered in Coachella Valley north of the Salton Sea.

Kamia

During the protohistoric period, the time between first European contact and the incorporation of Native Americans into the Euro-American political system, the traditional use area of the Kamia centered upon the banks of the Alamo River from Brawley south to Holtville, about 10 mi (16 km) northwest of the SEZ, along the New River and at Indian Wells (Knack 1981). The Kumeyaay in general are thought to have spread eastward from the California coast about AD 1000, eventually taking advantage of the resources provided by Lake Cahuilla,[17] which formed intermittently in the Salton Basin from at least 1200 into the seventeenth century (Schaefer and Laylander 2007). Changes in the weather pattern beginning about 1829 resulted in increasing aridity in the basin, and the Kamia moved southeastward following the retreating water sources, eventually joining with the Quechan around 1849 (Knack 1981). What is known of their culture is based on interviews conducted in the early part of the twentieth century with elderly Kamia descendants living on the Fort Yuma reservation (Gifford 1931).

Although speakers of the same language, the Kamia relied less completely on gathering and hunting than did their western Kumeyaay neighbors. Influenced by their Quechan neighbors, they grew maize, beans, taparies, and melons, but would often prefer to gather an abundant wild crop (Luomola 1978). They built substantial, rectangular semi-subterranean dwellings similar to those of the Quechan, but these were not grouped into nucleated villages, nor were they inhabited all year. Their crops, once planted and well started needed little additional tending, and the Kamia lineages scattered to collect wild foods as they began to ripen, most importantly honey mesquite and screwbeans. Honey Mesquite and screwbean pods could be stored and exchanged with their western neighbors for highland crops such as acorns, piñon nuts, tobacco, and agave

[17] Lake Cahuilla formed when the Colorado River shifted course to the west and flowed into the Salton Sea Basin, then dried when the river reverted to its former course. The process of formation and desiccation was cyclical before the construction of dams on the Colorado, with cycles lasting about 150 years (Redlands Institute 2002).

hearts. The Kamia appear to have been on friendly terms with their neighbors and traded with the Quechan, Cahuilla, and Cocopah. Although the Kamia were not long-distance traders, their homeland did lie across the major Yuma-San Diego Trail that linked the Quechan to the coast near present-day San Diego (Cleland and Apple 2003). Most of their trading was with their western neighbors in the Jacumba-Campo area, near mountain springs. There they obtained important mineral resources—granite for mortars and metates and hematite for arrow straighteners—as well as woven goods and abalone shell from the coasts. They occasionally visited the Cocopah to the south to obtain akwil nuts and traded shells, eagle feathers, and salt. Their western Kumeyaay neighbors would sometimes winter with them, enjoying garden produce and fishing (Doyle et al. 2003; Knack 1981; Luomola 1978).

Culturally intermediate between the gathering and hunting Kumeyaay bands to the west and the River Yumans to the east, the Kamia adopted many traits of the Quechan, including floodplain farming, house construction, religious symbols and practices, and cremation of the dead (Luomola 1978).

Quechan

Sometimes referred to as the Yuma, the Quechan (Kwatsan) are a Yuman-speaking group closely allied with the Mohave traditionally centered at the confluence of the Gila and Colorado Rivers. While it is not clear when they arrived at the confluence, they were there by the 1770s. They were not mentioned by Francisco Vasquez de Coronado who passed through the area in 1540. Quechan tradition tells that the Tribe migrated south from the sacred mountain *Avikwaame,* in the Newberry Mountains near Laughlin, Nevada. They are thought to have arrived at the confluence sometime between the thirteenth and the eighteenth centuries. Traditionally, the Quechan practiced floodplain horticulture, depending on the annual floods of the Colorado River to replenish their fields with fresh silt. The fertility of the soil allowed for multiple plantings and harvests, which the Quechan supplemented by gathering plants from the desert and by fishing. During the growing season, they dispersed along the floodplains of the Colorado and the Gila Rivers, moving to the upper terraces during the winter. The Quechan prospered using simple technology. Their bows were simple and unbacked. Arrows often had no stone points. Digging sticks served for planting maize, and clothing was minimal (Bee 1983).

While their settlements were dispersed and independent, more than the inland Colorado Desert tribes, the Quechan had a sense that they were a Tribe, a nation occupying a specific territory. They acted together in warfare; acting together with their allies the Mohave, they were often at odds with the Halchidhoma, the Maricopa, and the Cocopah.

The confluence of the Gila and Colorado Rivers was an important crossing along the Yuma-San Diego Trail, which lead to the coast. Important to the Spanish and later the Americans, the Spanish established a mission there in 1779 only to have it destroyed by the Quechan and Cahuilla two years later. The Hispanic connection remained important to the Quechan who desired Spanish trade goods, for which they exchanged slaves captured during raids on their enemies (Knack 1981). After the defeat of Mexico in 1848, the United States established a fort at Yuma to control the crossing which was now an important wagon road. A reservation was established for the Quechan in 1884.

Quechan cosmology included ritually important trails. The most important of these remains the *Xam Kwatcan* Trail that follows the Colorado River connecting Pilot Knob (*Avikwalali*) with Spirit Mountain (*Avikwaame),* thus connecting a series of ritually important places of power (Johnson 2003).

The Quechan were on friendly terms with the Kamia and eventually accepted Kamias displaced from the Imperial Valley into their communities. It is perhaps for this reason that the territorial claim they presented to the Indian Claims Commission in the 1950s extends 10 mi (16 km) west of Mexicali and included the SEZ.

Cocopah

The Cocopah are a Yuman-speaking Tribe who inhabited the Colorado Delta downstream of the Quechan and the southern reaches of the New River and the Alamo River and parts of Arizona. When Spanish seafarers first made their way through the Gulf of California and up the Colorado River in 1540, they encountered the Cocopah in the delta. It is believed that they came southward along the Colorado River some time after AD 1000. They remained along the river when Lake Cahuilla was formed, but likely could not have inhabited the delta area, which would likely have dried up (Schaefer and Laylander 2007). It is thought that as the lake diminished, Quechan and Mohave who had lived along the lake returned to the Colorado River, displacing the Cocopah to the reforming delta. The long-standing antipathy between the Cocopah and the Quechan and Mohave may have its roots in this event. The Cocopah had friendly relations with the Kumeyaay and Maricopa. They were allied in war with the Maricopa and traded with the Kumeyaay, including the Kamia (Doyle et al. 2003; de Williams 1983).

The Cocopah practiced floodplain agriculture but incorporated more irrigation structures such as dykes and dams than their northern neighbors. Like them, they practiced a seasonal round of food procurement. In the early part of the year, they moved to the high desert seeking agave and gisnaga cactus fruit. With the spring, they traveled downstream to islands near the gulf to harvest wild rice. By midsummer, there were more fish in the river and they returned northward, where they planted maize, beans, and squash as flood waters receded. Like their neighbors, honey mesquite was their most important wild food source, but they harvested other pods and seeds as well. Their housing was likewise seasonally adapted. Four-post semi-subterranean structures were their winter homes, built near their fields, while domed brush structures marked their seasonal summer camps (de Williams 1983).

The Gadsen Purchase in 1853 divided the Cocopah who lived in the newly acquired United States territory from those living in Mexico. They continued to live along the river and are first mentioned near Yuma, Arizona, in 1873. Throughout the latter half of the nineteenth century, they adapted to the newcomers by engaging in the riverboat trade then thriving on the Colorado River. They sold wood to fuel the boats and became known as expert river pilots. With the demise of the river traffic their fortunes diminished. They dispersed to serve as day laborers in the new irrigation-fed agricultural economy that began to flourish around Yuma and in the Imperial Valley in the early part of the twentieth century, and were first granted reservation lands in the United States in 1917. They remained reclusive until the 1960s, when with the advice of neighboring Tribes, they began the process of developing their reservation lands (de Williams 1983).

Cahuilla

The Cahuilla occupied the Coachella Valley. Their society was composed of lineage-based groups with hereditary leaders, but with no overarching sociopolitical organization. They are believed to have entered the Colorado Desert from the Great Basin sometime between 500 BC and AD 500. They were hunters and gatherers living in permanent villages near reliable water. They appear to have first settled on the shores of Lake Cahuilla and then moved to the mountains as the lake dried. The Cahuilla tended toward larger groups consisting of multiple lineages (Lightfoot and Parish 2009). Preferred settlement sites were near mesquite stands or palm oases. They considered the latter to be sacred (Bean et al. 1978). While villages were occupied year-round, small groups would move seasonally to temporary camps to collect localized plant resources or to hunt. Larger groups would travel to the mountains together with mountain allies to harvest pinyon nuts and acorns. These would be brought to the permanent villages for storage. Species important to the Cahuilla are discussed in Section 9.1.18.

The Cahuilla were long-distance traders. The routes westward through San Gorgonio Pass to the coast lay within their traditional use area, and the Cahuilla maintained trading relationships east of the Colorado River with the Maricopa. They participated in a trade network that stretched as far east as the Great Plains (Bean et al. 1978). While The Cocomaricopa Trail connecting the coast with the Colorado and Gila Rivers passed through their traditional use area (Cleland and Apple 2003) and their major trade orientation appears to have been east–west, they also interacted with their southern neighbors, the Kamia.

9.1.17.1.3 History

The first Europeans to explore southern California were the Spanish in the mid-1500s. Extensive exploration did not take place until the establishment of missions on the Pacific Coast beginning in 1769 (Redlands Institute 2002). The Colorado Desert was an obstacle to avoid during these early years of European exploration. The first Spaniard to cross the desert was Juan Bautista de Anza who crossed a portion of the Colorado Desert in the mid-1770s. He was attempting to establish an overland supply route to the missions on the California coast from those in southern Arizona. The de Anza expedition left modern Arizona in 1774. They followed the Colorado River south from Yuma close to the Colorado delta before turning northwest. The expedition crossed the Salton Basin west of modern Calexico (Doyle et al. 2003). De Anza eventually reached the missions along the coast and returned. After these crossings, the trail was not used again until the 1820s. Those crossing the Colorado Desert in the 1820s were also attempting to connect the missions on the Pacific with those in Arizona. Increasing exploration of the area also brought fur traders into the area during the same period (Doyle et al. 2003). All of the trips across the desert took the route south and west of modern Calexico. It was not until the discovery of gold that the trail system was used heavily.

European settlement in the California area greatly expanded when gold was discovered in 1849 on the American River near Sutter's Mill. The influx of people was so great due to the gold rush that California achieved statehood in the following year. Statehood and gold helped encourage the establishment of railroads into California. In 1853, a group laying out a prospective southern railroad route through the Colorado Desert followed along the eastern shore of prehistoric Lake Cahuilla from north to south. The proposing of this route brought attention to the resources of the Salton Basin. The first rail lines into the Salton Basin were laid in 1875. The railroads extended to Yuma in 1877. The railroad network into the area expanded significantly after the introduction of irrigated agriculture after 1900.

The potential for irrigation and commercial-scale agriculture in the Imperial Valley was first conceived by Dr. Oliver Wozencraft in 1849 (Doyle et al. 2003). His plans failed because of government distractions during the political and social upheavals that culminated in the Civil War. Other attempts were made and failed until money was finally allocated in 1900 to install an irrigation canal from the Colorado River into the Salton Basin. Due to design studies conducted during the late nineteenth century, the canal was to tap into the Colorado River in Mexico and run west to the Alamo River. Work began in 1900 on the Imperial Canal. The canal began operating the following year. A lack of maintenance on the canal and an unusually severe winter in 1904-1905 resulted in the canal being compromised by flood waters in 1905 (Doyle et al. 2003). It was this break that formed the modern Salton Sea. It took two years for the break to be completely repaired. In 1911, the IID was established, and in 1916, it took control of the canal. In 1928, Congress passed the Boulder Canyon Project Act, which authorized construction of the Boulder Dam and the All-American Canal. Actual construction began in 1934. The canal began operating in 1948 after delays caused by WWII.

Once irrigation began in 1901, the area became a major agricultural area. Much of the development in the Salton Basin was the result of the irrigation. Many of the towns in the Imperial Valley were established shortly after the irrigation system was completed. The towns of Imperial, Calexico, Brawley, Holtville, and El Centro were all established between 1900 and 1904 (Doyle et al. 2003). Additional economic development in the Imperial Valley came from the mining of gypsum, salt, manganese, and sand and gravel. Recreation became a source of revenue beginning in the post WWII years. Much of the recreation has focused on the Salton Sea. Fishing, boating, camping, hiking, and wildlife viewing are all activities that have become popular in the Imperial Valley. Several thousand people bring their recreational vehicles to the area every winter (Doyle et al. 2003).

A final aspect of the history of the Imperial Valley was the creation of the CAMA and DTC in 1942 by General George S. Patton. The training area extended from western Arizona, northwest to the Mohave Desert of California, to east of the Salton Sea. Other military facilities in the Imperial Valley included the Old Sandy Beach Naval Station and the Naval Auxiliary Air Station located on the southwest shore of the Salton Sea, and Camp Dunlop (Doyle et al. 2003). East of the Imperial Valley is the Chocolate Mountain Naval Aerial Gunnery Range, which is one part of a larger Naval Air Facility based out of El Centro.

9.1.17.1.4 Traditional Cultural Properties—Landscape

Colorado Desert Tribes take a holistic view of the world; they see the features of their environment as an interconnected whole imbued with a life force. Prominent features may be seen as places of power and sacred places. High hills and mountains tend to be regarded as sacred, while some peaks have special status. Other features that tend to be regarded as sacred include caves, certain rock formations, springs, and hot springs. Revered locations include panels of rock art, evidence of ancestral settlements, arranged-rock sites, burial or cremation areas, and systems of trails. Sacred sites are often seen as places of power where offerings are left (Halmo 2003). Tribes see themselves as exercising divinely given responsibilities of stewardship over the lands where they believe they were created and as retaining a divine birthright to those lands. Specific mountain peaks are seen as points of emergence associated with creation stories. Tribal belief systems and ceremonial activities throughout the region have many elements in common. Many of these common elements have Mohave roots. There remains considerable interaction among the Tribes. A system of alliances furthered trade and the sharing of hunting and gathering grounds.

From the Native American perspective, the proposed Imperial East SEZ is encompassed by a sacred landscape tied together by a network of trails. Passing through the former Kamia settlement of Xahupai, near modern Indian Wells, the Yuma-San Diego Trail comes close to or passes through the SEZ. While an important trade route, it also links two sacred areas. The trail links Pilot Knob (*Avikwalali*), one of the foci of traditional ritual activities for the Quechan, Cocopah, and Kamia with another sacred area on Yuha Mesa (BOR 1994; Cleland and Apple 2003; Doyle et al. 2003). The cultural features at Yuha Basin form a Discontiguous District listed in the *National Register of Historic Places* (NRHP) and are included in the Yuha Basin ACEC. It is located 35 mi (56 km) west of the SEZ. The linked sites include such features as shaman hearths, spirit breaks, memorial cairns, trail cairns, burial cairns, initiation sites, and geoglyphs (Doyle et al. 2003). Such sacred areas served as cross-cultural common grounds or joint use areas for ceremonial activities (Johnson 2003). Pilot Knob serves as the southern terminus of the *Xam Kwatcan* Trail, thus linking the Imperial Valley to the sacred origin mountain *Avikwaame*, in southern Nevada. These trails seldom consist of a single path but were a network of alternative parallel paths most visible on the shoulders and tops of ridge systems, relatively stable alluvial fans, and other upland areas where footing was solid and there was less vegetation to deal with (Cleland and Apple 2003). Pilot Knob is included in BLM ACEC 73 (BLM 1999). It is located 20 mi (32 km) to the east of the SEZ and is visible on a clear day. Picacho Peak, located farther north along the trail and 34 mi (55 km) northeast of the SEZ, is another sacred feature (Singleton 2010a). Its peak would be just visible from the SEZ. The western branch of the *Xam Kwatcan* Trail (Trail of Dreams) reaches a crossroads at Indian Pass ACEC about 27 mi (43 km) northeast of the SEZ and passes the Gold Basin and Rand Intaglios ACEC located about 20 mi (33 km) northeast of the SEZ.

There are no reported pit-house remains in the Imperial East SEZ, but archaeological surveys along the All-American Canal, which parallels the southern boundary of the SEZ, found the area to have a relatively high density of Native American cultural remains (BOR 1994). Before the construction of the dams on the Colorado River lowered its height along the southern reach of the river, the SEZ would have been on its floodplain and may have been inundated during spring flooding. It is possible that fields were planted when waters receded, but more likely it was primarily used as a seasonal gathering area.

According to a Sacred Lands File Search through the Native American Heritage Commission, two burials are recorded in Township and Range sections partially included in the Imperial East SEZ (Singleton 2010b).

9.1.17.1.5 Cultural Surveys and Known Archaeological and Historic Resources

One archaeological survey has been conducted within the Imperial East SEZ in the northwest corner of the SEZ, according to GIS data available from the El Centro Field Office. No sites within the SEZ were recorded from that survey; however, several sites were recorded northwest of the SEZ. Two sites within the SEZ are identified adjacent to State Route 98. Archaeological work conducted in the area is primarily associated with the All-American Canal Lining Project in the early 1990s. According to the 1994 Final Environmental Impact Statement for the project, the area along the canal south of the SEZ is an area of known high density of both prehistoric and historic cultural remains. More than 50 sites have been recorded between the SEZ and the United States–Mexico International Border, most of these are south of the All-American Canal outside of the SEZ. Approximately 40 sites have been recorded directly to the west and southwest of the SEZ, and two sites have been recorded in close proximity to the SEZ in the east. No sites have been recorded to the north and northeast in the dune areas, but no surveys appear to have been conducted in this region, with the exception of the survey described above at the westernmost end of the SEZ.

The BLM has designated several locations within relatively close proximity to the proposed Imperial East SEZ as ACECs because of their significant cultural value. The East Mesa ACEC is adjacent to the SEZ on the east and includes prehistoric resources as well as important biological resources. The four segments of the Lake Cahuilla ACEC include archaeological sites associated with the shores of prehistoric Lake Cahuilla. They range from directly adjacent on the west of the SEZ to about 9 mi (14.5 km) to the northwest. Important places of Native American value associated with the *Xam Kwatcan* Trail are included in the Pilot Knob ACEC about 20 mi (32 km) to the east, Indian Pass ACEC about 27 mi (43 km) to the northeast in the Chocolate Mountains, and the Gold Basin and Rand Intaglios ACEC about 20 mi (33 km) to the northeast. Traditionally, these locations were linked by a network of trails to sites on the western edge of the Imperial Valley: the Yuha Basin ACEC about 27 mi (44 km) to the west of the SEZ, West Mesa SEZ about 35 mi (57 km) to the northwest, and the San Sebastian Marsh/San Felipe Creek ACEC located some 43 mi (70 km) northwest of the SEZ. The latter ACEC also includes historic resources. The Plank Road ACEC, about 10 mi (16 km) east of the SEZ is designated to protect a unique historic road.

National Register of Historic Places

There are no historic properties listed in the NRHP within the SEZ or within 5 mi (8 km) of the SEZ. The All-American Canal is an eligible historic resource that runs adjacent to the SEZ to the south but is not currently listed.

9.1.17.2 Impacts

Direct impacts on significant cultural resources could occur in the proposed Imperial East SEZ; however, as stated in Section 9.1.17.1, further investigation is needed in a number of areas. A cultural resource survey of the entire area of potential effect (APE) of a proposed project would first need to be conducted to identify archaeological sites, historic structures and features, and traditional cultural properties, and an evaluation would need to follow to determine whether any are eligible for listing in the NRHP. Possible impacts from solar energy development on cultural resources that are encountered within the SEZ or along related ROWs are described in more detail in Section 5.15. Impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2. Programmatic design features assume that the necessary surveys, evaluations, and consultations will occur.

Programmatic design features to reduce water runoff and sedimentation would prevent the likelihood of indirect impacts on cultural resources resulting from erosion outside of the SEZ boundary (including along ROWs). Indirect impacts on cultural resources outside of the SEZ as a result of vandalism or theft are unlikely since the SEZ is small in size and is readily accessible and no new access pathways are assumed (see below).

No new access roads or transmission lines have been assessed for the Imperial East SEZ, assuming existing corridors would be used; impacts on cultural resources related to the creation of new corridors would be evaluated at the project-specific level if new road or transmission construction or line upgrades are to occur.

Because of the interconnectedness of the landscape in Native American cosmology, a change in one part affects the whole; thus damage to one part of the sacred landscape would affect the entire network. The proposed Imperial East SEZ includes or is close to the Yuma-San Diego Trail. Since visible segments tend to follow the shoulders and tops of ridge systems, it is likely that they will not be directly affected by the development of solar facilities. However, Native Americans have expressed concern over the visual impacts of development on segments of those trails that have religious importance (Halmo 2003). Development that is visible from the trails or sacred areas may be considered intrusive. The Imperial East SEZ is not pristine wilderness. It is crossed and bordered by a major interstate highway (I-8) and the All-American Canal. It is relatively distant from Pilot Knob, Yuha Mesa, and Picacho Peak. The horse geoglyph at the base of Pilot Knob is at the base of its southern side. Only a power tower would be visible from that side of the mountain. The site would be visible, but probably not dominant from Picacho Peak. It is also on the valley floor, and a solar facility may be visible from a distance. The construction of an extensive solar energy facility would have more visual impact on the landscape than already exists.

9.1.17.3 SEZ-Specific Design Features and Design Feature Effectiveness

Programmatic design features to mitigate adverse effects on significant cultural resources, such as avoidance of significant sites and features and cultural awareness training for the workforce, are provided in Appendix A, Section A.2.2.

SEZ-specific design features would be determined in consultation with the California SHPO and affected Tribes. Consultation efforts should include discussions on significant archaeological sites and traditional cultural properties and on sacred sites and trails with views of the proposed SEZ. Because of the possibility for burials in the vicinity of the proposed Imperial East SEZ and its location along the Yuma-San Diego Trail interconnecting a sacred landscape and its associated sites, it is recommended that for surveys conducted in the SEZ, consideration be given to including Native American representatives in the development of survey designs and historic property treatment and monitoring plans.

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9.1.18 Native American Concerns

Native Americans share many environmental and socioeconomic concerns with other ethnic groups. For a discussion of issues of possible Native American concern shared with the population as a whole, several sections in this PEIS should be consulted. General topics of concern are addressed in Section 4.16. Specifically for the proposed Imperial East SEZ, Section 9.1.17 discusses archaeological sites, structures, landscapes, trails, and traditional cultural properties; Section 9.1.8 discusses mineral resources; Section 9.1.9.1.3 discusses water rights and water use; Section 9.1.10 discusses plant species; Section 9.1.11 discusses wildlife species, including wildlife migration patterns; Section 9.1.13 discusses air quality; Section 9.1.14 discusses visual resources; Sections 9.1.19 and 9.1.20 discuss socioeconomics and environmental justice, respectively; and issues of human health and safety are discussed in Section 5.21. This section focuses on concerns that are specific to Native Americans and to which Native Americans bring a distinct perspective.

Many Native Americans tend to view the whole of the landscape as interconnected and as imbued with a life force, including features and objects viewed by Euro-American cultures as inanimate. The importance of landscapes, geophysical features, trails, rock art, and archaeological sites is discussed in Section 9.1.17. To the extent that these features are religiously significant, it is important to the Tribes that they retain access to those located on federal land as required by the American Indian Religious Freedom Act (AIRFA). They may also regard activities that Euro-Americans would consider secular as having sacred components. For example, for many Native Americans, the taking of game or the gathering of plants or other natural resources is seen as both a sacred and a secular act (Stoffle et al. 1990). The California Native American Heritage Commission (NAHC) has consulted its Sacred Lands File and determined that a Native American burial or village is located in two of the sections at least partially included in the SEZ (Singleton 2010b).

The NAHC has also been consulted to determine which Tribes have a traditional association with the California SEZs (Singleton 2010b). All federally recognized Tribes with traditional ties to the Imperial East SEZ were contacted so that they could identify their concerns regarding solar energy development. Table 9.1.18-1 lists the Tribes contacted because of their traditional ties to the SEZs in southeastern California. Appendix K lists all federally recognized Tribes contacted for this PEIS. The concerns Native Americans have brought up thus far about energy development projects are summarized in this section. Their comments provide important insights into their concerns over energy development in the area.

9.1.18.1 Affected Environment

As discussed in Section 9.1.17.1.2, the territorial boundaries of the Tribes who inhabited the Colorado Desert appear to have been fluid over time. At times they overlapped, and resources were shared where abundant. The Imperial East SEZ, devoid of reliable water sources until the construction of the All-American Canal, does not appear to have been the site of any long-term Native American habitation. While primarily in the traditional range of the Kamia (Knack 1981), it was likely used intermittently and jointly by the surrounding Tribes: the

TABLE 9.1.18-1 Federally Recognized Tribes with Traditional Ties to the Southeastern California SEZs

Tribe	Location	State
Agua Caliente Band of Cahuilla Indians	Palm Springs	California
Cabazon Band of Cahuilla Mission Indians	Indio	California
Cahuilla Band of Mission Indians	Anza	California
Campo Kumeyaay Nation	Campo	California
Chemehuevi Indian Tribe	Havasu Lake	California
Cocopah Indian Tribe	Somerton	Arizona
Colorado River Indian Tribes	Parker	Arizona
Ewiiaapaayp Band of Kumeyaay Indians	Alpine	California
Fort Mojave Indian Tribe	Needles	California
La Posta Band of Kumeyaay Indians	Boulevard	California
Los Coyotes Band of Cahuilla & Cupeno Indians	Warm Springs	California
Manzanita Band of Kumeyaay Indians	Boulevard	California
Morongo Band of Mission Indians	Banning	California
Quechan Indian Tribe of the Fort Yuma Reservation	Yuma	Arizona
Salt River Pima-Maricopa Indian Community	Scottsdale	Arizona
San Fernando Band of Mission Indians	Newhall	California
San Manuel Band of Mission Indians	Patton	California
Soboba Band of Luiseño Indians	San Jacinto	California
Sycuan Band of the Kumeyaay Nation	El Cajon	California
Torres-Martinez Desert Cahuilla Indians	Thermal	California
Twentynine Palms Band of Mission Indians	Coachella	California
Viejas Band of Kumeyaay Indians	Alpine	California

Quechan, Cocopah, and perhaps the Cahuilla as well. The Tribal Traditional Use Area boundaries considered here are those presented by the Tribes themselves to the Indian Claims Commission in the 1950s where they exist. While the commission recognized some of the individual claims of the Quechan, most of California, including much of the Imperial Valley, was judged to be the common territory of the "Indians of California" and is so shown on maps of judicially established Native American land claims (Royster 2008). This category was created by Congress to accommodate the claims of California Native Americans who had lost their identity as distinct tribes, bands, or villages due to the arrival and policies of Euro-Americans (Indian Claims Commission 1958). The claims of the Cahuilla and much of the land claimed by Quechan lie within the territory assigned to the Indians of California, but were presented individually to the commission (Indian Claims Commission 1958; CSRI 2002).

9.1.18.1.1 Territorial Boundaries

Kamia

Remnants of the Kamia had been absorbed by the Quechan by the mid-nineteenth century. They made no separate claim to the Indian Claims Commission, but their homeland, centered on New River and Alamo River, is included in the claims presented to the commission by the Quechan. Kamia territory, as reconstructed from ethnographic sources, would have included the Imperial East SEZ (Knack 1981). Kamia descendants can be found on the Fort Yuma Indian Reservation, located approximately 20 mi (32 km) east of the SEZ.

Quechan

While the heart of Quechan territory lies at the confluence of the Gila and Colorado Rivers well to the east of the SEZ, because the Kamia joined them and because the Quechan traveled westward along the Yuma–San Diego Trail to trade, the territorial claim they presented before the Commission includes the Imperial East SEZ. As presented, their territory extended westward to 10 mi (16 km) west of Mexicali and paralleled the New River northward, encompassing the southern end of the Salton Trough (Indian Claims Commission 1958). Their claim overlaps with that of the Cahuilla and includes lands awarded by the commission to the Indians of California. Quechan descendants occupy the Fort Yuma Indian Reservation in Arizona and California.

Cocopah

The Cocopah appear to have presented no claim before the Indian Claims Commission. Traditionally, they occupied the lower reaches of the Colorado River as far as its mouth and the southern reaches of the New River and Alamo River in what is now Mexico. Earlier, they may have occupied the area now inhabited by the Quechan, with whom they were not on friendly terms. However, they did trade with the Kamia and probably traversed the Imperial East SEZ (de Williams 1983). Cocopah descendants reside on reservations centered around Somerton, Arizona.

Cahuilla

The Coachella Valley, northwest of the Imperial East SEZ, is the heart of Cahuilla territory. Their traditional use area was well north of the SEZ. The southern boundary of the claim presented to the Indian Claims Commission extends from a point northeast of Volcan Mountain through "a point in the area of the Salton Sea, which is approximately 14 mi [23 km] west of the town of Niland" to a point 3 mi (5 km) south of the Riverside County line about 12 mi (19 km) west of the Colorado River (CSRI 2002). The Cahuilla appear to have been on friendly terms with the Kamia and, as traders, may have been familiar with the Yuma–San Diego Trail. Cahuilla descendants can be found on several small reservations in Southern California, including those of the Morongo Band of Mission Indians in Banning and the Agua Caliente Band of Cahuilla Indians in Palm Springs.

9.1.18.1.2 Plant Resources

The traditional Native American subsistence base in the Colorado Desert was a combination of floodplain agriculture and hunting and gathering. The proportion of farming to gathering varied with the Tribe and the land occupied. The banks of New River and Alamo River were used by the Kamia for floodplain agriculture, taking advantage of overflow from the Colorado River, which flowed northwest into the Salton Trough where it sank into the ground. The Imperial East SEZ may sometimes have been inundated during these periods of overflow. Archaeological surveys have shown a relatively high density of artifacts south of the All-American Canal. The SEZ does not appear to have been the center of Kamia occupation, although it may have been an area of traditional hunting and plant collecting.

The plant communities observed or likely to be present at the Imperial East SEZ are discussed in Section 9.1.10. Most of the SEZ is covered by Sonora-Mojave Creosotebush-White Bursage Desert Scrub and North American Warm Desert Active and Stabilized Dune plant communities (NatureServe 2008).

Native American populations have traditionally made use of hundreds of native plants. Table 9.1.18.1-1 lists plants often mentioned as important by Native Americans that were either observed at the Imperial East SEZ or are possible members of the cover-type plant communities identified at the SEZ. The table groups plants by use category, but individual plants are not necessarily confined to one category. These plants are the dominant species; however, other plants important to Native Americans could occur in the SEZ, depending on localized conditions

TABLE 9.1.18.1-1 Plant Species Important to Native Americans Observed or Likely To Be Present in the Proposed Imperial East SEZ

Common Name	Scientific Name	Status
Food		
Buckwheat	*Eriogonum* spp.	Possible
Honey mesquite	*Prosopis Glandolosa*	Observed
Saltbush	*Atriplex* spp.	Possible
Indigo bush	*Psorothamnus schotti*	Observed
Medicine		
Creosotebush	*Larrea tridentata*	Observed
Mormon tea	*Ephedra nevadensis*	Possible
Unspecified		
Boxthorn	*Lycium* sp.	Possible
Brittlebush	*Opuntia* sp.	Possible
Burrowbush	*Ambrosia dumosa*	Possible

Sources: Field visit and NatureServe (2008).

and the season. Creosotebush dominates the SEZ, while mesquite clusters in the western end. Mesquite was among the most important of the traditional wild food plants for Native Americans in this area. Its long, bean-like pods were harvested in the summer, could be stored, and were widely traded. Groves were managed by burning. Mesquite blossoms are edible, and the cicadas and grasshoppers that live in the groves were collected and eaten by the Cahuilla. Mesquite trunks served as a source of wood; fiber from its inner bark was made into string; its thorns were used for tattooing; and its gum was used as an adhesive, a cleansing agent, and medicine. Saltbush and buckwheat seeds were harvested, processed, and eaten (Lightfoot and Parish 2009).

The proposed Imperial East SEZ includes other plants useful to Native Americans. The leaves of the dominant creosote bush were widely made into tea for medicinal purposes, as was a tea made from *Ephedra* spp., or Mormon tea (Lightfoot and Parish 2009). While some of the plant species present at the SEZ were used by Native Americans, they do not appear to be especially plentiful in the SEZ. It is likely that better sources of these plants existed elsewhere.

9.1.18.1.3 Other Resources

Animal species potentially present in the proposed Imperial East SEZ are listed in Table 9.1.18.1-2. The SEZ has a relatively low potential for game species. Before the construction of the All-American Canal this area would likely have been too dry for game birds; with the canal, quail, a traditional tribal game species, may be present (see Section 9.1.11.2). The

TABLE 9.1.18.1-2 Animal Species Used by Native Americans Whose Range Includes the Proposed Imperial East SEZ

Common Name	Scientific Name	Status
Mammals		
Bighorn sheep	*Ovis canadensis*	All year
Black-tailed jackrabbit	*Lepus californicus*	All year
Coyote	*Canis latrans*	All year
Desert cottontail	*Silvilagus audubonii*	All year
Ground squirrel	*Spermophilus* sp. and *Ammospermophilus* sp.	All year
Wood rat	*Neotoma* spp.	All year
Birds		
Doves		
White-winged dove	*Zenaida asiatica*	Summer
Mourning dove	*Zenaida macrocura*	All year
Gambel’s quail	*Callipepla gambelii*	All year
Reptiles		
Rattlesnakes	*Crotalus* spp.	All year

Sources: Lightfoot and Parrish (2009); de Williams (1983).

SEZ is within the range of the desert mountain sheep. It is not preferred habitat, but individuals may pass through (see 9.1.11.3.1). Black-tailed jackrabbit (*Lepus californicus*) and desert cottontail (*Sylvilagus audubonii*), both traditionally hunted by Native Americans in the area (Doyle et al. 2003; Lightfoot and Parrish 2009), are likely to be present in the SEZ as are other small animals traditionally used as food.

As long-time desert dwellers, Native Americans have a great appreciation for the importance of water in an arid environment. They have expressed concern over the use and availability of water for solar energy installations (Halmo 2003; Jackson 2009). Contamination of groundwater was one of the main concerns for industrial developments planned in this region in the past (CSRI 1987).

Some Tribes share with the populace as a whole concerns over potential danger from electromagnetic fields. In traditional Cahuilla culture, electricity, both natural (lightning) and artificially generated, is considered dangerous and something to be avoided (Bean et al. 1978). They may have concerns over a facility that produces electricity and its associated transmission system.

In addition, Native Americans have expressed concern over ecological segmentation, that is, development that fragments animal habitat and does not provide corridors for movement. They would prefer solar energy development take place on land that has already been disturbed, such as abandoned farmland, rather than on undisturbed ground (Jackson 2009).

9.1.18.2 Impacts

To date, no comments have been received from the Tribes specifically referencing the proposed Imperial East SEZ. However, in a response letter, the Quechan Indian Tribe of Fort Yuma indicates that some of the California SEZs lie within their Tribal Traditional Use Area, presumably including the Imperial SEZ. The Tribe stresses the importance of evaluating impacts of development on landscapes as a whole (Jackson 2009). The Imperial East SEZ is already surrounded by modern development. The All-American Canal and the United States–Mexico border fence parallel its southern boundary; a freeway, I-8, marks its northern boundary; and it includes hydropower plants and electric substations associated with the canal. These comprise already existing intrusions into the traditional Tribal landscape.

The impacts expected on resources important to Native Americans from solar energy development within the Imperial East SEZ fall into two major categories: impacts on the landscape and impacts on discrete localized resources.

Potential landscape-scale impacts are those caused by the presence of an industrial facility within a culturally important landscape that includes sacred mountains and other geophysical features tied together by a network of sacred trails. Impacts may be visual—the intrusion of an industrial feature in sacred space—or audible—noise from the construction, operation, or decommissioning of a facility detracting from the traditional cultural values of the site. As consultation with the Tribes continues and project-specific analyses are undertaken, it is possible that Native Americans will express concerns over potential visual and other effects of solar energy development within the SEZ on a culturally important landscape, including features such as Pilot Knob and Picacho Peak, and on shrines and sacred places (see also Section 9.1.17); however, known features of this type are 20 to 35 mi (32 to 56 km) away from the SEZ. Section 9.1.14 discusses visual impacts and viewing distances.

Localized effects are possible both within the SEZ and in adjacent areas. Within the SEZ, these effects would include destroying or degrading important plant resources, destroying the habitat of and impeding the movement of culturally important animal species, and destroying archaeological sites and burials. Any ground-disturbing activity associated with development within the SEZ has the potential for destruction of localized resources. Since solar energy facilities cover large tracts of ground, even taking into account the implementation of design features, it is unlikely that avoidance of all resources would be possible. However, as discussed in Sections 9.1.10 and 9.1.11, impacts on plant and animal resources are expected to be small since there is an abundance of similar plant and animal habitat in the area. Programmatic design features (see Appendix A, Section A.2.2) assume that the necessary cultural surveys, site evaluations, and Tribal consultations will occur.

Implementation of programmatic design features, as discussed in Appendix A, Section A.2.2, should eliminate impacts on Tribes' reserved water rights and the potential for groundwater contamination issues.

9.1.18.3 SEZ-Specific Design Features and Design Feature Effectiveness

Programmatic design features to mitigate impacts of potential concern to Native Americans, such as avoidance of burials, sacred sites, water sources, and tribally important plant and animal species, are provided in Appendix A, Section A.2.2.

The development of solar energy facilities in the state of California requires developers to follow CEC guidelines for interacting with Native Americans in addition to Federal requirements (CEC 2009a). Developers must obtain information from California's NAHC on the presence of Native American sacred sites in the project vicinity and a list of Native Americans who want to be contacted about proposed projects in the region. Table 9.1.18.3-1 lists the Tribes recommended for contact by the NAHC.

The need for and nature of SEZ-specific design features regarding potential issues of concern, such as burials, the Yuma-San Diego Trail, and Pilot Knob, would be determined during government-to-government consultation with affected Tribes.

TABLE 9.1.18.3-1 Federally Recognized Tribes Listed by the NAHC to Contact Regarding the Proposed Imperial East SEZ

Tribe	Location	State
Agua Caliente Band of Cahuilla Indians	Palm Springs	California
Chemehuevi Indian Tribe	Havasu Lake	California
Colorado River Indian Tribes	Parker	Arizona
Cocopah Indian Tribe	Somerton	Arizona
Fort Mojave Indian Tribe	Needles	California
Morongo Band of Mission Indians	Banning	California
Quechan Indian Tribe of the Fort Yuma Reservation	Yuma	Arizona
San Manuel Band of Mission Indians	Patton	California
Torres-Martinez Desert Cahuilla Indians	Thermal	California
Twentynine Palms Band of Mission Indians	Coachella	California

Sources: (Singleton 2010a,b).

The Quechan Tribe has requested that they be consulted at the inception of any solar energy project that would affect resources important to them. The Quechan also suggest that the clustering of large solar energy facilities be avoided, that priority for development be given to lands that have already been disturbed by agricultural or military use, and that the feasibility of placing solar collectors on existing structures be considered, thus minimizing or avoiding the use of undisturbed land (Jackson 2009).

Mitigation of impacts on archaeological sites and traditional cultural properties is discussed in Section 9.1.17.3, in addition to programmatic design features for historic properties discussed in Appendix A, Section A.2.2.

9.1.19 Socioeconomics

9.1.19.1 Affected Environment

This section describes current socioeconomic conditions and local community services within the region of influence (ROI) surrounding the proposed Imperial East SEZ. The ROI is a two-county area consisting of Yuma County in Arizona and Imperial County in California. It encompasses the area in which workers are expected to spend most of their salaries and in which a portion of site purchases and nonpayroll expenditures from the construction, operation, and decommissioning phases of the proposed SEZ facility are expected to take place.

9.1.19.1.1 ROI Employment

In 2008, employment in the ROI stood at 126,391 (Table 9.1.19.1-1). Over the period 1999 to 2008, the annual average employment growth rate was slightly higher in Yuma County (3.6%) than in Imperial County (3.0%). At 3.3%, the growth rate in the ROI as a whole was higher than the average rates for Arizona (2.3%) and California (0.9%).

In 2006, the service sector provided the highest percentage of employment in the ROI at 38.2%, followed by wholesale and retail trade with 23.3% (Table 9.1.19.1-2). Smaller employment shares were held by agriculture (15.2%), manufacturing (8.1%), and construction (7.4%). Within the ROI, the distribution of employment across sectors is similar to that of the ROI as a whole, but with a higher percentage of employment in agriculture (21.1%) and a lower percentage (30.1%) in services in Imperial County, and slightly lower employment in agriculture (10.3%) and slightly higher employment in services (44.4%) in Yuma County.

TABLE 9.1.19.1-1 ROI Employment in the Proposed Imperial East SEZ

Location	1999	2008	Average Annual Growth Rate, 1999–2008 (%)
Yuma County, Arizona	48,903	69,683	3.6
Imperial County, California	42,162	56,708	3.0
ROI	91,065	126,391	3.3
Arizona		2,960,199	2.3
California	15,566,900	17,059,574	0.9

Sources: U.S Department of Labor (2009a,b).

TABLE 9.1.19.1-2 ROI Employment in the Proposed Imperial East SEZ by Sector, 2006[a]

	Yuma County, Arizona		Imperial County, California		ROI	
	Employment	% of Total	Employment	% of Total	Employment	% of Total
Agriculture[a]	5,017	10.3	8,711	21.1	13,728	15.2
Mining	53	0.1	175	0.4	228	0.3
Construction	4,696	9.6	1,995	4.8	6,691	7.4
Manufacturing	3,374	6.9	3,938	9.5	7,312	8.1
Transportation and public utilities	1,471	3.0	1,981	4.8	3,452	3.8
Wholesale and retail trade	10,624	21.8	10,393	25.2	21,017	23.3
Finance, insurance, and real estate	1,874	3.8	1,495	3.6	3,369	3.7
Services	21,636	44.4	12,768	30.9	34,404	38.2
Other	10	0.0	6	0.0	16	0.0
Total	48,746		41,275		90,021	

[a] Agricultural employment includes 2007 data for hired farmworkers.

Sources: U.S. Bureau of the Census (2009a); USDA (2009a,b).

9.1.19.1.2 ROI Unemployment

Unemployment rates have been high in both counties in the ROI. Over the period 1999 to 2008, the average rate in Imperial County was 17.7%, slightly higher than the rate in Yuma County (17.4%) (Table 9.1.19.1-3). The average rate in the ROI over this period was 17.5%, much higher than the average rates for California (5.8%) and Arizona (4.8%). Unemployment rates for the first 10 months of 2009 contrast markedly with rates for 2008 as a whole; in Imperial County, the unemployment rate increased to 29.3%, while in Yuma County the rate reached 21.3%. The average rates for the ROI (25.1%), for California (11.6%), and for Arizona (8.4%) were also higher during this period than the corresponding average rates for 2008.

9.1.19.1.3 ROI Urban Population

The population of the ROI in 2008 was 72% urban, with a group of cities clustered around El Centro in the southern portion of Imperial County, and the largest population centered on Yuma, in the western part of Yuma County.

The largest urban area in Imperial County, El Centro, had an estimated 2006 to 2008 population of 40,081; other cities in the county include Calexico (37,978) and Brawley (22,593) (Table 9.1.19.1-4). In addition, four other cities in the county had a 2006 to 2008 population ranging between 2,185 and 13,444 persons. Most of these cities are about 20 mi (32 km) from the site of the proposed SEZ. Population growth rates among the cities in Imperial County have varied over the period 2000 to 2008. Imperial grew at an annual rate of 7.5% during this period, with higher than average growth also experienced in Calexico (4.3%). The cities of El Centro (0.7%), Calipatria (0.5%), Brawley (0.4%), Westmoreland (0.3%), and Holtville (–0.5%) all experienced lower growth rates between 2000 and 2008.

TABLE 9.1.19.1-3 ROI Unemployment Rates for the Proposed Imperial East SEZ (%)

Location	1999–2008	2008	2009[a]
Yuma County, Arizona	17.4	17.1	21.3
Imperial County, California	17.7	22.9	29.3
ROI	17.5	19.8	25.1
Arizona	4.8	5.5	8.4
California	5.8	7.2	11.6

[a] Rates for 2009 are the average for January through November.

Sources: U.S. Department of Labor (2009a–c).

TABLE 9.1.19.1-4 ROI Urban Population and Income for the Proposed Imperial East SEZ

	Population			Median Household Income ($ 2008)		
City	2000	2008	Average Annual Growth Rate, 2000–2008 (%)	1999	2006–2008	Average Annual Growth Rate, 1999 and 2006–2008 (%)[a]
Yuma, Arizona	77,715	89,842	1.9	45,545	42,095	–0.9
El Centro	37,835	40,081	0.7	42,695	36,959	–1.6
Calexico	27,109	37,978	4.3	37,247	32,288	–1.5
San Luis, Arizona	15,322	24,654	6.1	29,569	23,305	–2.6
Brawley	22,052	22,593	0.4	40,270	35,582	–1.4
Imperial	7,560	13,444	7.5	63,669	NA	NA
Somerton, Arizona	7,266	12,146	6.9	34,176	NA	NA
Calipatria	7,289	7,566	0.5	39,864	NA	NA
Holtville	5,612	5,396	–0.5	46,760	NA	NA
Westmoreland	2,131	2,185	0.3	30,083	NA	NA
Wellton, Arizona	1,829	1,921	0.6	34,821	NA	NA

[a] Data are averages for the period 2006 to 2008.

Source: U.S. Bureau of the Census (2009b-d).

Yuma County has three small cities—San Luis (24,654), Somerton (12,146), and Wellton (1,921)—in addition to Yuma (89,842). Population growth between 2000 and 2008 was relatively high in Somerton (6.9%) and San Luis (6.1%), with annual growth rates of 1.9% in Yuma and 0.6% in Wellton.

9.1.19.1.4 ROI Urban Income

Median household incomes varied considerably across cities in the ROI. One city in Imperial County, Imperial ($63,669), had median incomes in 1999 that were higher than the average for the state ($61,154) (Table 9.1.19.1-4). The remainder of the cities in the ROI had relatively low median household incomes, and two cities—Westmoreland ($30,083) and San Luis ($29,569)—had median incomes that were less than half the state average.

Data on median household incomes in the ROI for the period 2006 to 2008 were only available for five cities. Among these cities, median incomes growth rates for the period 1999 and 2006 to 2008 were negative, with a fairly large decline in median incomes in San Luis (–2.6%). The average median household income growth rate for the state as a whole over this period was less than 0.1%.

9.1.19.1.5 ROI Population

Table 9.1.19.1-5 presents recent and projected populations in the ROI and states as a whole. Population in the ROI stood at 356,392 in 2008, having grown at an average annual rate of 2.1% since 2000. The average annual growth rate for the ROI was lower than that for Arizona (3.2%) and higher than that for California (1.5%) over the same period.

Both counties in the ROI have experienced growth in population since 2000; population in Yuma County grew at an annual rate of 2.4% between 2000 and 2008, while in Imperial County population grew by 1.7% over the same period. The ROI population is expected to increase to 519,735 by 2021 and to 583,043 by 2023.

9.1.19.1.6 ROI Income

Personal income in the ROI stood at $8.4 billion in 2007 and has grown at an annual average rate of 2.4% over the period 1998 to 2007 (Table 9.1.19.1-6). Per capita income in the ROI fell over the same period at a rate of −0.3%, declining from $23,036 to $22,375. Per-capita incomes were slightly higher in Imperial County ($22,476) than in Yuma County ($22,194) in 2007. Per-capita income growth rates were lower in both counties than the corresponding state rates for Arizona (0.9%) and California (1.1%).

Median household incomes in 2006 to 2008 varied from $37,492 in Imperial County to $40,079 in Yuma County (U.S. Bureau of the Census 2009d).

TABLE 9.1.19.1-5 ROI Population for the Proposed Imperial East SEZ

Location	2000	2008	Average Annual Growth Rate, 2000–2008 (%)	2021	2023
Yuma County, Arizona	160,026	193,299	2.4	276,132	285,531
Imperial County, California	142,361	163,093	1.7	243,603	252,512
ROI	302,387	356,392	2.1	519,735	583,043
Arizona	5,130,632	6,622,885	3.2	8,945,447	9,271,163
California	34,105,437	38,129,628	1.5	44,646,420	45,667,413

Sources: U.S. Bureau of the Census (2009e,f); Arizona Department of Commerce (2010); California Department of Finance (2010).

TABLE 9.1.19.1-6 ROI Personal Income for the Proposed Imperial East SEZ

Location	1998	2007	Average Annual Growth Rate, 1998–2007 (%)
Yuma County, Arizona			
Total income[a]	3.3	4.5	3.0
Per-capita income	22,314	22,194	−0.1
Imperial County, California			
Total income[a]	3.3	4.0	1.8
Per-capita income	23,806	22,476	−0.6
ROI			
Total income[a]	6.6	8.4	2.4
Per-capita income	23,036	22,375	−0.3
Arizona			
Total income[a]	149.2	215.8	3.8
Per-capita income	30,551	33,558	0.9
California			
Total income[a]	1,231.7	1,573.6	2.5
Per-capita income	37,339	41,821	1.1

[a] Unless indicated otherwise, values are reported in $ billion 2008.

Sources: U.S. Department of Commerce (2009); U.S. Bureau of the Census (2009e,f).

9.1.19.1.7 ROI Housing

In 2007, more than 139,823 housing units were located in the two ROI counties, with about 62% of these located in Yuma County (Table 9.1.19.1-7). Owner-occupied units account for approximately 64% of the occupied units in the two counties, with rental housing making up 36% of the total. Vacancy rates in 2007 were 19.8% in Yuma County and 13.6% in Imperial County; 15.7% of housing units in Yuma County and 4.7% in Imperial County were used for seasonal or recreational purposes. With an overall vacancy rate of 17.5% in the ROI, there were 24,415 vacant housing units in the ROI in 2007, of which 8,868 are estimated to be rental units that would be available to construction workers. There were 13,750 seasonal, recreational, or occasional-use units in the ROI at the time of the 2000 Census.

Housing stock in the ROI as a whole grew at an annual rate of 2.4% over the period 2000 to 2007, with 21,792 new units added to the existing housing stock in the ROI (Table 9.1.19.1-7).

TABLE 9.1.19.1-7 ROI Housing Characteristics for the Proposed Imperial East SEZ

Parameter	2000	2007[a]
Yuma County, Arizona		
Owner-occupied	38,911	48,658
Rental	14,937	20,774
Vacant units	20,292	17,150
Seasonal and recreational use	11,668	NA
Total units	74,140	86,582
Imperial County, California		
Owner-occupied	22,975	24,831
Rental	16,409	21,145
Vacant units	4,507	7,265
Seasonal and recreational use	2,082	NA
Total units	43,891	53,241
ROI Total		
Owner-occupied	61,886	73,489
Rental	31,346	41,919
Vacant units	24,799	24,415
Seasonal and recreational use	13,750	NA
Total units	118,031	139,823

[a] NA = data not available.

Sources: U.S. Bureau of the Census (2009h,i).

The median value of owner-occupied housing in 2008 varied between $147,400 in Yuma County and $233,700 in Imperial County (U.S. Bureau of the Census 2009g).

9.1.19.1.8 ROI Local Government Organizations

The various local and county government organizations in Imperial County are listed in Table 9.1.19.1-8. No Tribal governments are located in the ROI, although there are members of Tribal groups located in the ROI, but whose Tribal governments are located in adjacent states.

9.1.19.1.9 ROI Community and Social Services

This section describes educational, health care, law enforcement, and firefighting resources in the ROI.

TABLE 9.1.19.1-8 ROI Local Government Organizations and Social Institutions in the Proposed Imperial East SEZ

Governments	
City	
Brawley	San Luis, Arizona
Calexico	Somerton, Arizona
Calipatria	Welton, Arizona
El Centro	Westmoreland
Holtville	Yuma, Arizona
Imperial	
County	
Imperial County	
Tribal	
None	

Sources: U.S. Bureau of the Census (2009b); U.S. Department of the Interior (2010).

Schools

In 2007, the six-county ROI had a total of 119 public and private elementary, middle, and high schools (NCES 2009). Table 9.1.19.1-9 provides summary statistics for enrollment and educational staffing and two indices of educational quality—student-teacher ratios and levels of service (number of teachers per 1,000 population). The student-teacher ratio in Yuma County schools (20.2) is slightly lower than that for schools in Imperial County (20.9), while the level of service is slightly higher in Imperial County (10.8) than in Yuma County, where there are fewer teachers per 1,000 population (9.5).

Health Care

The number of physicians (268) and the number of doctors per 1,000 population (1.4) are slightly higher in Yuma County than in Imperial County (150 and 0.9, respectively) (Table 9.1.19.1-10).

Public Safety

Several state, county, and local police departments provide law enforcement in the ROI (Table 9.1.19.1-11). Imperial County has 177 officers and would provide law enforcement

TABLE 9.1.19.1-9 ROI School District Data for the Proposed Imperial East SEZ, 2007

Location	Number of Students	Number of Teachers	Student-Teacher Ratio	Level of Service[a]
Yuma County, Arizona	55	1,800	20.2	9.5
Imperial County, California	64	1,735	20.9	10.8
ROI	119	3,535	20.5	10.1

[a] Number of teachers per 1,000 population.

Source: NCES (2009).

TABLE 9.1.19.1-10 Physicians in the Proposed Imperial East SEZ ROI, 2007

Location	Number of Primary Care Physicians	Level of Service[a]
Yuma County, Arizona	268	1.4
Imperial County, California	150	0.9
ROI	418	1.1

[a] Number of physicians per 1,000 population.

Source: AMA (2009).

services to the SEZ; there are 68 officers in Yuma County. Currently, there are 237 professional firefighters in the ROI (Table 9.1.19.1-11). Levels of service of police protection are 1.1 per 1,000 population in Imperial County and 0.4 in Yuma County.

9.1.19.1.10 ROI Social Structure and Social Change

Community social structures and other forms of social organization within the ROI are related to various factors, including historical development, major economic activities and sources of employment, income levels, race and ethnicity, and forms of local political organization. Although an analysis of the character of community social structures is beyond the scope of the current programmatic analysis, project-level NEPA analyses would include a description of ROI social structures, contributing factors, their uniqueness, and consequently, the susceptibility of local communities to various forms of social disruption and social change.

TABLE 9.1.19.1-11 Public Safety Employment in the Proposed Imperial East SEZ ROI

Location	Number of Police Officers[a]	Level of Service[b]	Number of Firefighters[c]	Level of Service
Yuma County, Arizona	68	0.4	127	0.7
Imperial County, California	177	1.1	110	0.7
ROI	245	0.7	237	0.7

[a] 2007 data.

[b] Number per 1,000 population.

[c] 2008 data; number does not include volunteers.

Sources: U.S. Department of Justice (2008); Fire Departments Network (2009).

Various energy development studies have suggested that once the annual growth in population is between 5 and 15% in smaller rural communities, alcoholism, depression, suicide, social conflict, divorce, and delinquency would increase and levels of community satisfaction would deteriorate (BLM 1980, 1983, 1996). Tables 9.1.19.1-12 and 9.1.19.1-13 present data for a number of indicators of social change, including violent crime and property crime rates, alcoholism and illicit drug use, and mental health and divorce, that might be used to indicate social change.

There is some variation in the level of crime across the ROI, with slightly higher rates of violent crime in Yuma County (3.1 per 1,000 population) than in Imperial County (2.9) (Table 9.1.19.1-12). Property-related crime rates are slightly higher in Imperial County (33.4) than in Yuma County (21.1), meaning that overall crime rates in Imperial County (36.0) were higher than for Yuma County (24.2).

Other measures of social change—alcoholism, illicit drug use, and mental health—are not available at the county level and thus are presented for the SAMHSA region in which the ROI is located. There is some variation across the two regions in which the two counties are located, with slightly higher rates for alcoholism and illicit drug in the region in which Imperial County is located and slightly higher rates of mental illness in the region in which Yuma County is located (Table 9.1.19.1-13).

9.1.19.1.11 ROI Recreation

Various areas in the vicinity of the proposed SEZ are used for recreational purposes, with natural, ecological, and cultural resources in the ROI attracting visitors for a range of activities, including hunting, fishing, boating, canoeing, wildlife watching, camping, hiking, horseback riding, mountain climbing, and sightseeing. These areas are discussed in Section 9.1.5.

TABLE 9.1.19.1-12 County and ROI Crime Rates for the Proposed Imperial East SEZ ROI[a]

	Violent Crime[b]		Property Crime[c]		All Crime	
Location	Offenses	Rate	Offenses	Rate	Offenses	Rate
Yuma County, Arizona	637	3.1	4,376	21.1	5,013	24.2
Imperial County, California	474	2.9	6,025	33.4	6,499	36.0
ROI	1,111	2.9	10,401	26.8	11,512	29.7

[a] Rates are the number of crimes per 1,000 population.

[b] Violent crime includes murder and non-negligent manslaughter, forcible rape, robbery, and aggravated assault.

[c] Property crime includes burglary, larceny, theft, motor vehicle theft, and arson.

Sources: U.S. Department of Justice (2009a,b).

TABLE 9.1.19.1-13 Alcoholism, Drug Use, Mental Health, and Divorce in the Proposed Imperial East SEZ ROI[a]

Geographic Area	Alcoholism	Illicit Drug Use	Mental Health[b]	Divorce[c]
Arizona Rural South Region (includes Yuma County)	7.3	2.6	8.8	–[d]
California Region 13 (includes Imperial County)	8.5	3.2	8.6	–
Arizona				3.9
California				4.3

[a] Data for alcoholism and drug use represent percentage of the population over 12 years of age with dependence or abuse of alcohol, illicit drugs. Data are averages for 2004 to 2006.

[b] Data for mental health represent percentage of the population over 18 years of age suffering from serious psychological distress. Data are averages for 2002 to 2004.

[c] Divorce rates are the number of divorces per 1,000 population. Data are for 1990.

[d] A dash indicates data not available.

Sources: SAMHSA (2009); CDC (2009).

Because the number of visitors using state and federal lands for recreational activities is not available from the various administering agencies, the value of recreational resources in these areas, based solely on the number of recorded visitors, is likely to be an underestimation. In addition to visitation rates, the economic valuation of certain natural resources can also be assessed in terms of the potential recreational destination for current and future users, that is, their nonmarket value (see Section 5.17.1.1).

Another method is to estimate the economic impact of the various recreational activities supported by natural resources on public land in the vicinity of the proposed solar development, by identifying sectors in the economy in which expenditures on recreational activities occur. Not all activities in these sectors are directly related to recreation on state and federal lands, with some activity occurring on private land (e.g., dude ranches, golf courses, bowling alleys, and movie theaters). Expenditures associated with recreational activities form an important part of the economy of the ROI. In 2007, 10,020 people were employed in the ROI in the various sectors identified as recreation, constituting 8.2% of total ROI employment (Table 9.1.19.1-14). Recreation spending also produced $198 million in income in the ROI in 2007. The primary sources of recreation-related employment were eating and drinking places.

9.1.19.2 Impacts

The following analysis begins with a description of the common impacts of solar development, including common impacts on recreation and on social change. These impacts would occur regardless of the solar technology developed in the SEZ. The impacts of developments employing various solar energy technologies are analyzed in detail in subsequent sections.

TABLE 9.1.19.1-14 ROI Recreation Sector Activity in the Proposed Imperial East SEZ, 2007

ROI	Employment[b]	Income ($ million)
Amusement and recreation services	74	1.5
Automotive rental	142	12.7
Eating and drinking places	7,874	133.5
Hotels and lodging places	549	12.2
Museums and historic sites,	14	0.4
Recreational vehicle parks and campsites	385	10.4
Scenic tours	457	18.4
Sporting goods retailers	525	9.2
Total ROI	10,020	198.3

Source: MIG, Inc. (2009).

9.1.19.2.1 Common Impacts

Construction and operation of a solar energy facility at the proposed Imperial East SEZ would produce direct and indirect economic impacts. Direct impacts would occur as a result of expenditures on wages and salaries, procurement of goods and services required for project construction and operation, and the collection of state sales and income taxes. Indirect impacts would occur as project wages and salaries, procurement expenditures, and tax revenues subsequently circulate through the economy of each state, thereby creating additional employment, income, and tax revenues. Facility construction and operation would also require in-migration of workers and their families into the ROI surrounding the site, which would affect population, rental housing, health service employment, and public safety employment. Socioeconomic impacts common to all utility-scale solar energy developments are discussed in detail in Section 5.17. These impacts will be minimized through the implementation of programmatic design features described in Appendix A, Section A.2.2.

Recreation Impacts

Estimating the impact of solar facilities on recreation is problematic, because it is not clear how solar development in the SEZ would affect recreational visitation and nonmarket values (i.e., the value of recreational resources for potential or future visits; see Section 5.17.1.2.3). While it is clear that some land in the ROI would no longer be accessible for recreation, the majority of popular recreational locations would be precluded from solar development. It is also possible that solar facilities in the ROI would be visible from popular recreation locations, and that construction workers residing temporarily in the ROI would occupy accommodation otherwise used for recreational visits, thus reducing visitation and consequently affecting the economy of the ROI.

Social Change

Although an extensive literature in sociology documents the most significant components of social change in energy boomtowns, the nature and magnitude of the social impact of energy developments in small rural communities are still unclear (see Section 5.17.1.1.4). While some degree of social disruption is likely to accompany large-scale in-migration during the boom phase, there is insufficient evidence to predict the extent to which specific communities are likely to be affected, which population groups within each community are likely to be most affected, and the extent to which social disruption is likely to persist beyond the end of the boom period (Smith et al. 2001). Accordingly, because of the lack of adequate social baseline data, it has been suggested that social disruption is likely to occur once an arbitrary population growth rate associated with solar energy development projects has been reached, with an annual rate of between 5 and 10% growth in population assumed to result in a breakdown in social structures, with a consequent increase in alcoholism, depression, suicide, social conflict, divorce, delinquency, and deterioration in levels of community satisfaction (BLM 1980, 1983, 1996).

In overall terms, the in-migration of workers and their families into the ROI would represent an increase of 0.3% in county population during construction of the trough technology, with smaller increases for the power tower, dish engine, and PV technologies, and during the operation of each technology. While it is possible that some construction and operations workers will choose to locate in communities closer to the SEZ, the lack of available housing to accommodate all in-migrating workers and families in smaller rural communities in the ROI, and insufficient range of housing choices to suit all solar occupations, many workers are likely to commute to the SEZ from larger communities elsewhere in the ROI, thereby reducing the potential impact of solar development on social change. Regardless of the pace of population growth associated with the commercial development of solar resources, and the likely residential location of in-migrating workers and families in communities some distance from the SEZ itself, the number of new residents from outside the ROI is likely to lead to some demographic and social change in small rural communities in the ROI. Communities hosting solar development are likely to be required to adapt to a different quality of life, with a transition away from a more traditional lifestyle involving ranching and taking place in small, isolated, close-knit, homogenous communities with a strong orientation toward personal and family relationships, toward a more urban lifestyle, with increasing cultural and ethnic diversity, and increasing dependence on formal social relationships within the community.

9.1.19.2.2 Technology-Specific Impacts

The economic impacts of solar energy development in the proposed SEZ were measured in terms of employment, income, state tax revenues (sales and income), population in-migration, housing, and community service employment (education, health, and public safety). More information on the data and methods used in the analysis are provided in Appendix M.

The assessment of the impact of the construction and operation of each technology was based on SEZ acreage, assuming 80% of the area could be developed. To capture a range of possible impacts, solar facility size was estimated on the basis of land requirements of various solar technologies, assuming that 9 acres/MW (0.04 km^2/MW) would be required for power tower, dish engine, and PV technologies, and 5 acres/MW (0.02 km^2/MW) for solar trough technologies. Impacts of multiple facilities employing a given technology at each SEZ were assumed to be the same as impacts for a single facility with the same total capacity. Construction impacts were assessed for a representative peak year of construction, assumed to be 2021 for each technology. Construction impacts assumed that a maximum of one project could be constructed within a given year, with a corresponding maximum land disturbance of up to 3,000 acres (12 km^2). For operations impacts, a representative first year of operations was assumed to be 2023 for trough and power tower, 2022 for the minimum facility size for dish engine and PV, and 2023 for the maximum facility size for these technologies. The years of construction and operations were selected as representative of the entire 20-year study period, because they are the approximate midpoint; construction and operations could begin earlier.

Solar Trough

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of solar trough technology would be up to 2,769 jobs (Table 9.1.19.2-1).

Construction activities would constitute 1.5% of total ROI employment. A solar development would also produce $159.9 million in income. Direct sales taxes would be $0.6 million; direct income taxes, $6.1 million.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 1,325 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units would not be expected to be large, with 663 rental units expected to be occupied in the ROI. This occupancy rate would represent 5.4% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration also would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, 13 new teachers, 2 physicians, and 2 public safety employees (career firefighters and uniformed police officers) would be required in the ROI. These increases would represent 0.3% of total ROI employment expected in these occupations.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) from a build-out using solar trough technologies would be 288 jobs (Table 9.1.19.2-1). Such a solar development would also produce $9.8 million in income. Direct sales taxes would be $0.1 million; direct income taxes, $0.3 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010b), acreage rental payments would be $1.1 million, and solar generating capacity payments would total at least $6.0 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 65 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility operation on the number of vacant owner-occupied housing units would not be expected to be large, with 59 owner-occupied units expected to be occupied in the ROI.

TABLE 9.1.19.2-1 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Imperial East SEZ with Trough Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	1,682	199
Total	2,769	288
Income[b]		
Total	159.9	9.8
Direct state taxes[b]		
Sales	0.6	0.1
Income	6.1	0.3
BLM payments ($ million 2008)		
Rental	NA[d]	1.1
Capacity[e]	NA	6.0
In-migrants (no.)	1,325	65
Vacant housing[c] (no.)	663	59
Local community service employment		
Teachers (no.)	13	1
Physicians (no.)	2	0
Public safety (no.)	2	0

a Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 600 MW (corresponding to 3,000 acres [12 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 916 MW.

b Unless indicated otherwise, values are reported in $ million 2008.

c Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

d NA = not applicable.

e The BLM annual capacity payment was based on a fee of $6,570 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010b), assuming a solar facility with no storage capability, and full build-out of the site. Projects with three or more hours of storage would generate higher payments, based on a fee of $7,884 per MW.

In addition to the potential impact on housing markets, in-migration would affect community service (health, education, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the provision of these services in the ROI. Accordingly, one new teacher would be required in the ROI.

Power Tower

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of power tower technology would be up to 1,103 jobs (Table 9.1.19.2-2). Construction activities would constitute 0.6% of total ROI employment. Such a solar development would also produce $63.7 million in income. Direct sales taxes would be less than $0.2 million; direct income taxes, $2.4 million.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 528 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units would not be expected to be large, with 264 rental units expected to be occupied in the ROI. This occupancy rate would represent 2.2% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, five new teachers, one physician, and one public safety employee would be required in the ROI. These increases would represent 0.1% of total ROI employment expected in these occupations.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) from a build-out using power tower technologies would be 133 jobs (Table 9.1.19.2-2). Such a solar development would also produce $4.3 million in income. Direct sales taxes would be less than $0.1 million; direct income taxes, $0.2 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010b), acreage rental payments would be $1.1 million, and solar generating capacity payments would total at least $3.3 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a power tower facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 34 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility operation on the number of vacant

TABLE 9.1.19.2-2 ROI Socioeconomic Impacts Assuming Full Build-out of the Imperial East SEZ with Power Tower Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	670	103
Total	1,103	133
Income[b]		
Total	63.7	4.3
Direct state taxes[b]		
Sales	0.2	<0.1
Income	2.4	0.2
BLM payments ($ million 2008)		
Rental	NA[d]	1.1
Capacity[e]	NA	3.3
In-migrants (no.)	528	34
Vacant housing[c] (no.)	264	30
Local community service employment		
Teachers (no.)	5	0
Physicians (no.)	1	0
Public safety (no.)	1	0

[a] Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 333 MW (corresponding to 3,000 acres [12 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 509 MW.

[b] Unless indicated otherwise, values are reported in $ million 2008.

[c] Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

[d] NA = not applicable.

e The BLM annual capacity payment was based on a fee of $6,570 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010b), assuming a solar facility with no storage capability, and full build-out of the site. Projects with three or more hours of storage would generate higher payments, based on a fee of $7,884 per MW.

owner-occupied housing units would not be expected to be large, with 30 owner-occupied units expected to be required in the ROI.

No new community service employment would be required to meet existing levels of service in the ROI.

Dish Engine

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of dish engine technology would be up to 448 jobs (Table 9.1.19.2-3). Construction activities would constitute 0.2% of total ROI employment. Such a solar development would also produce $25.9 million in income. Direct sales taxes would be $0.1 million; direct income taxes, $1.0 million.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a dish engine facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 215 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units would not be expected to be large, with 107 rental units expected to be occupied in the ROI. This occupancy rate would represent 0.1% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, two new teachers would be required in the ROI. This increase would represent less than 0.1% of total ROI employment expected in this occupation.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) from a build-out using dish engine technology would be 129 jobs (Table 9.1.19.2-3). Such a solar development would also produce $4.2 million in income. Direct sales taxes would be less than $0.1 million; direct income taxes, $0.2 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010b), acreage rental payments would be $1.1 million, and solar generating capacity payments would total at least $3.3 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a dish engine solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 33 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile

TABLE 9.1.19.2-3 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Imperial East SEZ with Dish Engine Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	272	100
Total	448	129
Income[b]		
Total	25.9	4.2
Direct state taxes[b]		
Sales	0.1	<0.1
Income	1.0	0.2
BLM payments ($ million 2008)		
Rental	NA[d]	1.1
Capacity[e]	NA	3.3
In-migrants (no.)	215	33
Vacant housing[c] (no.)	107	29
Local community service employment		
Teachers (no.)	2	0
Physicians (no.)	0	0
Public safety (no.)	0	0

[a] Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 333 MW (corresponding to 3,000 acres [12 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 509 MW.

[b] Unless indicated otherwise, values are reported in $ million 2008.

[c] Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

[d] NA = not applicable.

[e] The BLM annual capacity payment was based on a fee of $6,570 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010b), assuming a solar facility with no storage capability, and full build-out of the site. Projects with three or more hours of storage would generate higher payments, based on a fee of $7,884 per MW.

home parks) mean that the impact of solar facility operation on the number of vacant owner-occupied housing units would not be expected to be large, with 29 owner-occupied units expected to be required in the ROI.

No new community service employment would be required to meet existing levels of service in the ROI.

Photovoltaic

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of PV technology would be up to 209 jobs (Table 9.1.19.2-4). Construction activities would constitute 0.1% of total ROI employment. Such a solar development would also produce $12.1 million in income. Direct sales taxes would be less than $0.1 million; direct income taxes, $0.5 million.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 100 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units would not be expected to be large, with 50 rental units expected to be occupied in the ROI. This occupancy rate would represent 0.4% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, one new teacher would be required in the ROI. This increase would represent less than 0.1% of total ROI employment expected in this occupation.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) from a build-out using PV technologies would be 13 jobs (Table 9.1.19.2-4). Such a solar development would also produce $0.4 million in income. Direct sales taxes would be less than $0.1 million; direct income taxes, less than $0.1 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010b), acreage rental payments would be $1.1 million, and solar generating capacity payments would total at least $2.7 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a PV solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with three persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home

TABLE 9.1.19.2-4 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Imperial East SEZ with PV Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	127	10
Total	209	13
Income[b]		
Total	12.1	0.4
Direct state taxes[b]		
Sales	<0.1	<0.1
Income	0.5	<0.1
BLM payments ($ million 2008)		
Rental	NA[d]	1.1
Capacity[e]	NA	2.7
In-migrants (no.)	100	3
Vacant housing[c] (no.)	50	2
Local community service employment		
Teachers (no.)	1	0
Physicians (no.)	0	0
Public safety (no.)	0	0

a Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 333 MW (corresponding to 3,000 acres [12 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 509 MW.

b Unless indicated otherwise, values are reported in $ million 2008.

c Construction activities would affect vacant rental housing; operations activities would affect owner-occupied housing.

d NA = not applicable.

e The BLM annual capacity payment was based on a fee of $5,256 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010b), assuming full build-out of the site.

parks) mean that the impact of solar facility operation on the number of vacant owner-occupied housing units would not be expected to be large, with two owner-occupied units expected to be required in the ROI.

No new community service employment would be required to meet existing levels of service in the ROI.

9.1.19.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features addressing socioeconomic impacts have been identified for the proposed Imperial East SEZ. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would reduce the potential for socioeconomic impacts during all project phases.

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9.1.20 Environmental Justice

9.1.20.1 Affected Environment

Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" (*Federal Register*, Vol. 59, page 7629, Feb. 11, 1994) formally requires federal agencies to incorporate environmental justice as part of their missions. Specifically, it directs them to address, as appropriate, any disproportionately high and adverse human health or environmental effects of their actions, programs, or policies on minority and low-income populations.

The analysis of the impacts of solar energy projects on environmental justice issues follows guidelines described in the Council on Environmental Quality's (CEQ's) *Environmental Justice Guidance under the National Environmental Policy Act* (CEQ 1997). The analysis method has three parts: (1) a description of the geographic distribution of low-income and minority populations in the affected area is undertaken; (2) an assessment is conducted to determine whether construction and operation would produce impacts that are high and adverse; and (3) if impacts are high and adverse, a determination is made as to whether these impacts disproportionately affect minority and low-income populations.

Construction and operation of solar energy projects in the proposed Imperial East SEZ could affect environmental justice if any adverse health and environmental impacts resulting from either phase of development are significantly high and if these impacts disproportionately affect minority and low-income populations. If the analysis determines that health and environmental impacts are not significant, there can be no disproportionate impacts on minority and low-income populations. In the event impacts are significant, disproportionality would be determined by comparing the proximity of any high and adverse impacts with the location of low-income and minority populations.

The analysis of environmental justice issues associated with the development of solar facilities considered impacts within the SEZ and in an associated 50-mi (80-km) radius around the boundary of the SEZ. A description of the geographic distribution of minority and low-income groups in the affected area was based on demographic data from the 2000 Census (U.S. Bureau of the Census 2009k,l). The following definitions were used to define minority and low-income population groups:

- **Minority.** Persons are included in the minority category if they identify themselves as belonging to any of the following racial groups: (1) Hispanic, (2) Black (not of Hispanic origin) or African American, (3) American Indian or Alaska Native, (4) Asian, or (5) Native Hawaiian or Other Pacific Islander.

  Beginning with the 2000 Census, where appropriate, the census form allows individuals to designate multiple population group categories to reflect their ethnic or racial origins. In addition, persons who classify themselves as being of multiple racial origin may choose up to six racial groups as the basis of

their racial origins. The term minority includes all persons, including those classifying themselves in multiple racial categories, except those who classify themselves as not of Hispanic origin and as White or "Other Race" (U.S. Bureau of the Census 2009k).

The CEQ guidance proposed that minority populations be identified where either (1) the minority population of the affected area exceeds 50% or (2) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis.

The PEIS applies both criteria in using the Census Bureau data for census block groups, wherein consideration is given to the minority population that is both greater than 50% and 20 percentage points higher than in the state (the reference geographic unit).

- **Low-Income.** Individuals who fall below the poverty line. The poverty line takes into account family size and age of individuals in the family. In 1999, for example, the poverty line for a family of five with three children below the age of 18 was $19,882. For any given family below the poverty line, all family members are considered as being below the poverty line for the purposes of analysis (U.S. Bureau of the Census 2009l).

The data in Table 9.1.20.1-1 show the minority and low-income composition of the total population located in the proposed SEZ based on 2000 Census data and CEQ guidelines. Individuals identifying themselves as Hispanic or Latino are included in the table as a separate entry. However, because Hispanics can be of any race, this number also includes individuals identifying themselves as being part of one or more of the population groups listed in the table.

A large number of minority and low-income individuals are located in the 50-mi (80-km) area around the boundary of the SEZ. Within the 50-mi (80-km) radius in Arizona, 55.8% of the population is classified as minority, while 19.2% is classified as low-income. The number of minority individuals exceeds 50% of the total population in the area, and the number of minority individuals exceeds the state average by 20 percentage points or more; thus, there is a minority population in the SEZ area based on 2000 Census data and CEQ guidelines. The number of low-income individuals does not exceed the state average by 20 percentage points or more and does not exceed 50% of the total population in the area; thus, there are no low-income populations in the 50-mi (80-km) area around the boundary of the SEZ.

Within the 50-mi (80-km) radius in California, 80.1% of the population is classified as minority, while 22.6% is classified as low income. The number of minority individuals exceeds 50% of the total population in the area, and the number of minority individuals exceeds the state average by 20 percentage points or more; thus, there is a minority population in the SEZ area based on 2000 Census data and CEQ guidelines. The number of low-income individuals does not exceed the state average by 20 percentage points or more and does not exceed 50% of the total

TABLE 9.1.20.1-1 Minority and Low-Income Populations within the 50-mi (80-km) Radius Surrounding the Proposed Imperial East SEZ

Parameter	Arizona	California
Total population	155,910	149,237
White, non-Hispanic	68,985	29,751
Hispanic or Latino	78,732	106,238
Non-Hispanic or Latino minorities	8,193	13,248
One race	6,524	11,949
Black or African American	3,105	7,260
American Indian or Alaskan Native	1,804	1,784
Asian	1,353	2,569
Native Hawaiian or Other Pacific Islander	132	112
Some other race	130	224
Two or more races	1,669	1,299
Total minority	86,925	119,486
Low income	28,763	29,419
Percentage minority	55.8	80.1
State percentage minority	24.5	40.5
Percentage low-income	19.2	22.6
State percentage low-income	13.9	14.2

Source: U.S. Bureau of the Census (2009k.l).

population in the area; thus, there are no low-income populations in the 50-mi (80-km) area around the boundary of the SEZ.

Figures 9.1.20.1-1 and 9.1.20.1-2 show the locations of the minority and low-income population groups within the 50-mi (80-km) area around the boundary of the SEZ.

In the California portion of the 50-mi (80-km) radius around the SEZ, more than 50% of the population is classified as minority in block groups located to the west and northwest of the SEZ; in the area surrounding the cities of Brawley, El Centro, Imperial, Westmoreland, and Calipatria; in the city of Brawley itself;; and next to the Colorado River in the Fort Yuma Indian Reservation. Block groups with a minority population that is more than 20 percentage points higher than the state average are located to the west of the SEZ, in the cities of Mexicali, El Centro, Holtville, Brawley, Westmoreland, and Calipatria, and in the Fort Yuma Indian Reservation. In the Arizona portion of the 50-mi (80-km) radius, more than 50% of the population is classified as minority in block groups located to the immediate east and south of

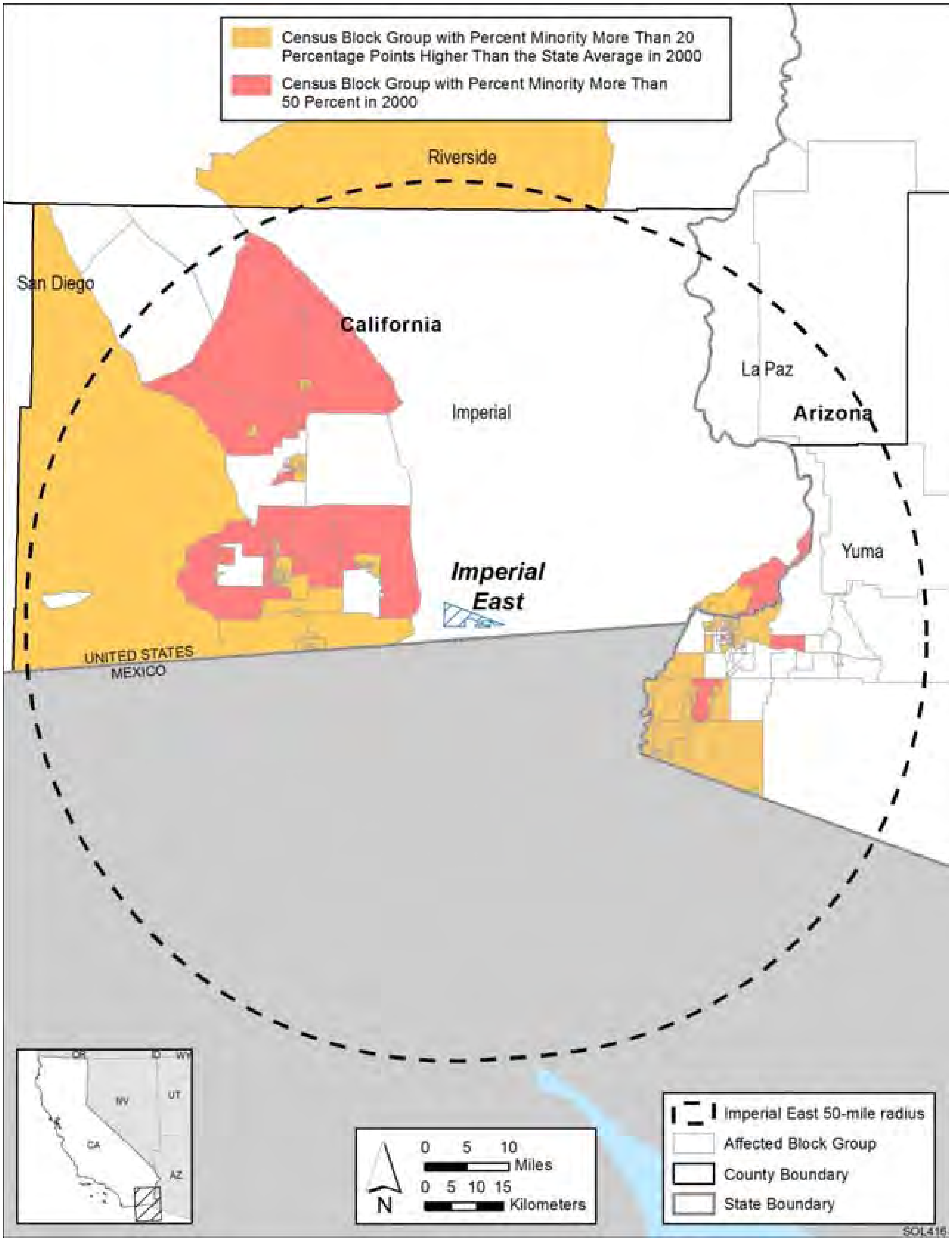

FIGURE 9.1.20.1-1 Minority Population Groups within the 50-mi (80-km) Area Surrounding the Proposed Imperial East SEZ

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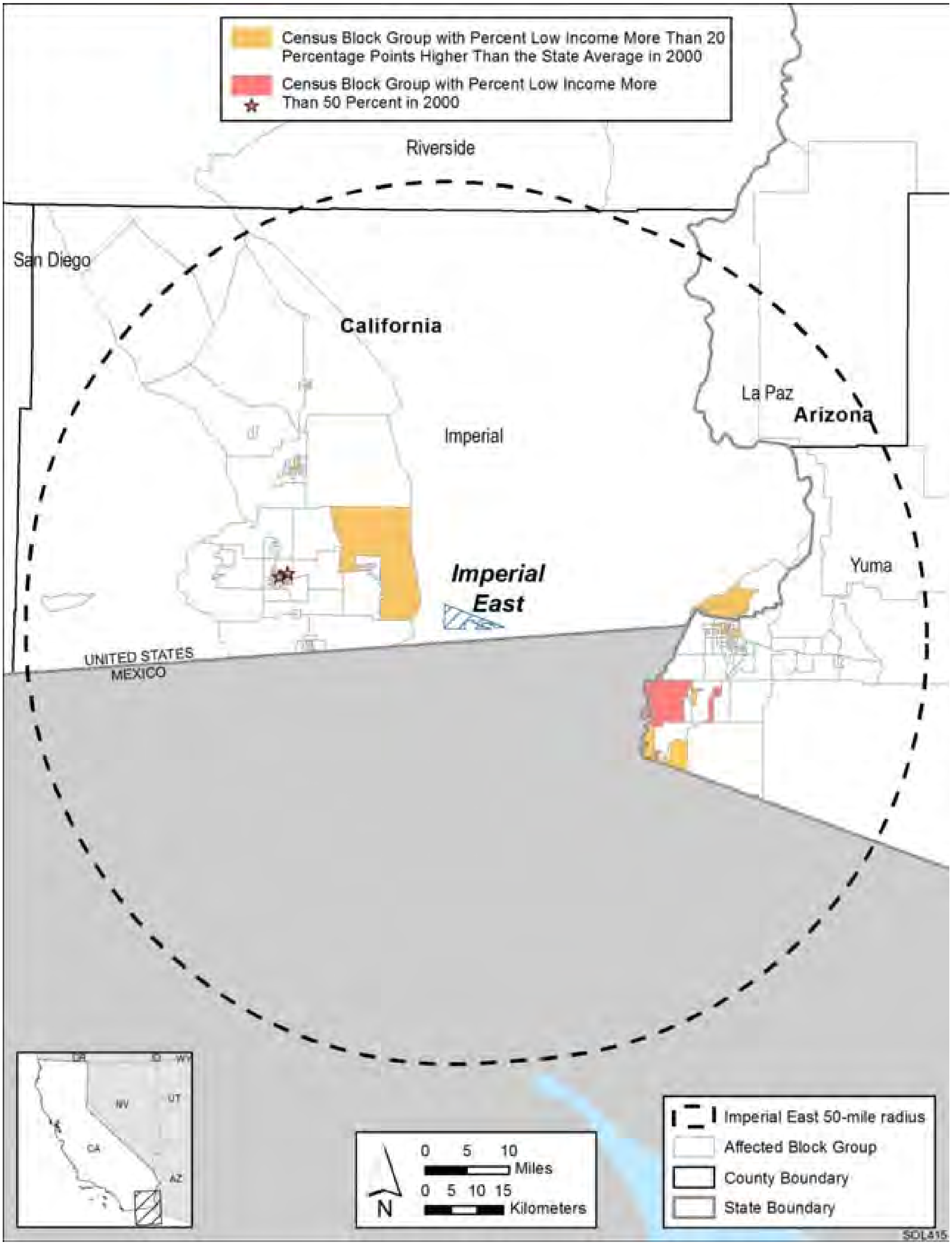

2 **FIGURE 9.1.20.1-2 Low-Income Population Groups within the 50-mi (80-km) Radius**
3 **Surrounding the Proposed Imperial East SEZ**

the city of Yuma. Block groups with a minority population that is more than 20 percentage points higher than the state average are located in the city of Yuma, to the immediate east and to the southwest of the city.

Low-income populations in the 50-mi (80-km) radius are limited to block groups in the City of El Centro, around the City of Holtville, and in the Fort Yuma Indian Reservation. In Arizona, there are a number of block groups in which the low-income population exceeds 50% of the total population and in which the low-income population is more than 20 percentage points higher than the state average, located to the southwest of the city of Yuma.

9.1.20.2 Impacts

Environmental justice concerns common to all utility-scale solar energy developments are described in detail in Section 5.18. These impacts will be minimized through the implementation of programmatic design features described in Appendix A, Section A.2.2, which address the underlying environmental impacts contributing to the concerns. The potentially relevant environmental impacts associated with solar development within the proposed Imperial East SEZ include noise and dust during the construction of solar facilities; noise and electromagnetic field (EMF) effects associated with solar project operations; the visual impacts of solar generation and auxiliary facilities, including transmission lines; access to land used for economic, cultural, or religious purposes; and effects on property values; these are areas of concern that might potentially affect minority and low-income populations. Minority populations have been identified within 50 mi (80 km) of the proposed Imperial East SEZ; no low-income populations are present (Section 9.1.20.1).

Potential impacts on low-income and minority populations could be incurred as a result of the construction and operation of solar development involving each of the four technologies. Although impacts are likely to be small, there are minority populations, as defined by CEQ guidelines (Section 9.1.20.1), within the 50-mi (80-km) radius around the boundary of the SEZ; thus any adverse impacts of solar projects could disproportionately affect minority populations. Because there are also low-income populations within the 50-mi (80-km) radius, according to CEQ guidelines, there could also be impacts on low-income populations.

9.1.20.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features addressing environmental justice impacts have been identified for the proposed Imperial East SEZ. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would reduce the potential for environmental justice impacts during all project phases.

9.1.21 Transportation

The proposed Imperial East SEZ is accessible by road. An interstate highway and a state highway border the SEZ, with a rail line about 17 mi (27 km) away. Three small airports are located within 34 mi (55 km) of the SEZ in the United States with a fourth small airport located approximately 5 mi (8 km) away in Mexico. General transportation considerations and impacts are discussed in Sections 3.4 and 5.19, respectively

9.1.21.1 Affected Environment

State Route 98, a two-lane highway, passes through the southern edge of the Imperial East SEZ, as shown in Figure 9.1.21-1. The figure also shows the designated open OHV routes in the proposed Imperial East SEZ. These routes were designated under the CDCA Plan (BLM 1999). The town of Calexico is located about 15 mi (24 km) to the west of the SEZ along State Route 98. To the east, State Route 98 terminates at I-8 at the southeast corner of the SEZ. I-8 forms the northeastern boundary of the SEZ. Yuma, Arizona is about 29 mi (47 km) to the east along I-8, and El Centro, California is 19 mi (31 km) to the west along I-8, with San Diego slightly more than another 100 mi (160 km) farther down the road. Annual average traffic volumes along State Route 98 and I-8 near the SEZ for 2008 are provided in Table 9.1.21.1-1.

A branch line of the Union Pacific (UP) Railroad serves the nearby area (Union Pacific Railroad 2009). Rail service is available in Calexico and El Centro to the west of the Imperial East SEZ. A branch line originates at the Niland stop along the UP railroad main line between Los Angeles and Tucson. This branch line travels south through El Centro and Calexico before it passes into Mexico. The UP main line also provides service to the east of the SEZ in Yuma.

Three small public airports on the United States side of the border with Mexico are within a driving distance of approximately 34 mi (55 km) of the Imperial East SEZ. The nearest public airport, which is suitable only for light aircraft, is the Calexico International Airport, approximately 18 mi (29 km) to the west of the SEZ, taking State Route 98 to State Route 111 south in Calexico. The airport is operated by the City of Calexico and has one asphalt runway that is 4,679-ft (1,426-m) long in good condition (FAA 2009).

The Imperial County Airport is located north of El Centro off State Route 86, north of I-8, approximately 25 mi (40 km) to the northwest of the SEZ. Owned and operated by the County of Imperial, this airport has two asphalt runways, 4,500- and 5,304-ft (1,372- and 1,617-m) long, both in good condition (FAA 2009). In 2008, the amount of commercial freight shipped and received at the Imperial County Airport was 1,374,379 lb (623,408 kg) and 975,544 lb (442,499 kg), respectively (BTS 2009). Scheduled passenger service at the airport is provided by Skywest/United Airlines or one of its partners (SkyWest 2004). In 2008, 11,837 and 11,665 passengers arrived and departed, respectively (BTS 2009).

Approximately 34 mi (55 km) to the east of the SEZ, the Yuma County Airport Authority (YCAA) operates the Yuma International Airport in Yuma, Arizona, with scheduled passenger

FIGURE 9.1.21-1 Local Transportation Network Serving the Proposed Imperial East SEZ

TABLE 9.1.21.1-1 AADT on Major Roads near the Proposed Imperial East SEZ, 2008

Road	General Direction	Location	AADT (Vehicles)
I-8	East–west	Junction State Route 111	14,600
		Junction State Route 7	11,200
		Junction U.S. 80/State Route 115	11,600
		Junction State Route 98	14,000
State Route 78	Southwest–northeast	Junction State Route 111	4,200
		Junction State Route 115	4,400
State Route 98	East–west	Junction State Route 111	24,100
		West of junction State Route 7	2,500
		Bonesteele Road (west of Imperial East SEZ)	1,900
		Junction I-8	1,950

Source: Caltrans (2009).

service provided by three airlines (Empire, Skywest/United, and Mesa/US Airways) (Yuma County Airport Authority 2010). The airport is jointly owned by Yuma County and the U.S. Marines Corps, and military activities (Yuma Marine Corps Air Station) account for about 50% of aircraft operations (AirNav, LLC 2010). The airport operates four runways, all in good condition. The longest runway is concrete and 13,300-ft (4,054-m) long (FAA 2009). The other three runways are asphalt/concrete with the shortest runway having a length of 5,710 ft (1,740 m) (FAA 2009). In 2009, the amount of commercial freight shipped and received at the Yuma International Airport was 669,802 lb (303,817 kg) and 940,501 lb (426,604 kg), respectively (BTS 2009). In 2010, 86,387 and 86,415 passengers arrived and departed, respectively (BTS 2009).

Mexicali General Rodolfo Sanchez Taboada International Airport (Mexicali Airport) is located approximately 5 mi (8 km) due southwest of the SEZ in Mexico. The airport has a single concrete runway that is 8,530 ft (2,600 m) long (World Aero Data 2010). Approximately 467,000 passengers passed through the airport in 2009 (Grupo Aeroportuario del Pacifico 2010).

9.1.21.2 Impacts

As discussed in Section 5.19, the primary transportation impacts are anticipated to be from commuting worker traffic. State Route 98 provides a regional traffic corridor that could experience moderate impacts for single projects that may have up to 1,000 daily workers, with an additional 2,000 vehicle trips per day (maximum). This would represent up to approximately two times the AADT values summarized in Table 9.1.21-1 for State Route 98 in the vicinity of the SEZ. For I-8, the exits at State Route 98 might experience some congestion as well. Local road improvements would be necessary in any portion of the SEZ along State Route 98 that might be developed so as not to overwhelm the local roads near any site access point(s).

Solar development within the SEZ would affect public access along OHV routes that are designated open and available for public use. Although there are few routes designated as open within the proposed SEZ, open routes crossing areas granted ROWs for solar facilities would be re-designated as closed (see Section 5.5.1 for more details on how routes coinciding with proposed solar facilities would be treated.

9.1.21.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features have been identified related to impacts on transportation systems around the Imperial East SEZ. The programmatic design features discussed in Appendix A, Section A.2.2, including local road improvements, multiple site access locations, staggered work schedules, and ride-sharing, would all provide some relief to traffic congestion on local roads leading to the SEZ. Depending on the location of a proposed solar facility within the SEZ, more specific access locations and local road improvements would be implemented. The proximity of the Mexicali Airport may require coordination with the proper Mexican authorities to minimize any potential impacts with flight traffic. However, all commercial passenger flights originating at or terminating at that airport are destined for southern Mexican cities, while the SEZ is to the northeast.

9.1.22 Cumulative Impacts

The analysis presented in this section addresses the potential cumulative impacts in the vicinity of the proposed Imperial East SEZ in Imperial County, California. The CEQ guidelines for implementing NEPA define cumulative impacts as environmental impacts resulting from the incremental impacts of an action when added to other past, present, and reasonably foreseeable future actions (40 CFR 1508.7). The impacts of other actions are considered without regard to the agency (federal or nonfederal), organization, or person that undertakes them. The time frame of this cumulative impacts assessment could appropriately include activities that would occur up to 20 years in the future (the general time frame for PEIS analyses), but little or no information is available for projects that could occur further than 5 to 10 years in the future.

The areas east and north of the Imperial East SEZ are largely undeveloped and have few permanent residents. Areas to the west and northwest are irrigated farmland receiving water from the All-American Canal that is immediately south of the Imperial East SEZ. The United States–Mexico border is within 2 mi (3 km) south of the proposed SEZ. The Imperial Sand Dunes are 10 to 15 mi (16 to 24 km) east and northeast. No grazing allotments or mineral mining activity occurs in the proposed Imperial East SEZ or within the immediate vicinity to the north and east.

The geographic extent of the cumulative impacts analysis for potentially affected resources near the Imperial East SEZ are identified in Section 9.1.22.1. An overview of ongoing and reasonably foreseeable future actions is presented in Section 9.1.22.2. General trends in population growth, energy demand, water availability, and climate change are discussed in Section 9.1.22.3. Cumulative impacts for each resource area are discussed in Section 9.1.22.4.

9.1.22.1 Geographic Extent of the Cumulative Impacts Analysis

The geographic extent of the cumulative impacts analysis for potentially affected resources evaluated near the Imperial East SEZ is provided in Table 9.1.22.1-1. These geographic areas define the boundaries encompassing potentially affected resources. Their extent may vary depending on the nature of the resource being evaluated and the distance at which an impact may occur. Thus, for example, the evaluation of air quality may have a greater regional extent of impact than would cultural resources. Most of the lands around the SEZ are administered by the BLM, the DoD, or the City of El Centro. In addition, the Section 368 utility corridor is overlapping and adjacent to the south and west of the SEZ; the Mexico border is within 2 mi (3 km) to the south, and Tribal Lands are 20 mi (30 km) to the east. The BLM administers nearly 23% of the lands within a 50-mi (80-km) radius of the SEZ.

TABLE 9.1.22.1-1 Geographic Extent of the Cumulative Impacts Analysis by Resource Area: Proposed Imperial East SEZ

Resource Area	Geographic Extent
Lands and Realty	Eastern Imperial County
Specially Designated Areas and Lands with Wilderness Characteristics	Within a 25-mi (40-km) radius of the Imperial East SEZ
Rangeland Resources	Eastern Imperial County
Recreation	Eastern Imperial County
Military and Civilian Aviation	For Military Aviation, southeastern California and western Arizona. For Civilian Aviation, eastern Imperial County
Soil Resources	Areas within and adjacent to the Imperial East SEZ
Minerals	Eastern Imperial County
Water resources	
Surface Water	Colorado River, All-American Canal
Groundwater	Imperial Valley Groundwater Basin
Air Quality and Climate	A 31-mi (50-km) radius from the center of the Imperial East SEZ
Vegetation, Wildlife and Aquatic Biota, Special Status Species	A 50-mi (80-km) radius from the center of the Imperial East SEZ, including portions of Imperial and Riverside Counties in California and La Paz and Yuma Countries in Arizona
Visual Resources	Viewshed within a 25-mi (40-km) radius of the Imperial East SEZ
Acoustic Environment (noise)	Areas adjacent to the Imperial East SEZ
Paleontological Resources	Areas within and adjacent to the Imperial East SEZ
Cultural Resources	Areas within and adjacent to the Imperial East SEZ for archaeological sites; viewshed within a 25-mi (40-km) radius of the SEZ for other properties, such as traditional cultural properties
Native American Concerns	Imperial Valley and adjacent areas within a 25-mi (40-km) radius of the Imperial East SEZ
Socioeconomics	A 50-mi (80-km) radius from the center of the Imperial East SEZ
Environmental Justice	Imperial County
Transportation	I- 8; State Route 98

9.1.22.2 Overview of Ongoing and Reasonably Foreseeable Future Actions

The future actions described below are those that are “reasonably foreseeable”; that is, they have already occurred, are ongoing, are funded for future implementation, or are included in firm near-term plans. Types of proposals with firm near-term plans are as follows:

- Proposals for which NEPA documents are in preparation or finalized;
- Proposals in a detailed design phase;
- Proposals listed in formal NOIs published in the *Federal Register* or state publications;
- Proposals for which enabling legislations has been passed; and
- Proposals that have been submitted to federal, state or county regulators to begin a permitting process.

Projects in the bidding or research phase or that have been put on hold were not included in the cumulative impact analysis.

The ongoing and reasonably foreseeable future actions described below are grouped into three categories: (1) actions that relate to energy production and distribution, including potential solar energy projects under the proposed action (Section 9.1.22.2.1) and (2) other ongoing and reasonably foreseeable actions, including those related to mining and mineral processing, grazing management, transportation, recreation, water management, and conservation (Section 9.1.22.2.2). Together, these actions have the potential to affect human and environmental receptors within the geographic range of potential impacts over the next 20 years.

9.1.22.2.1 Energy Production and Distribution

Reasonably foreseeable future actions related to energy production and distribution and other major actions within a 50-mi (80-km) radius from the center of the Imperial East SEZ, which includes portions of Imperial and Riverside Counties in California and La Paz and Yuma Counties in Arizona, are identified in Table 9.1.22.2-1 and described in the following sections. Locations are shown in Figure 9.1.22.2-1. Future renewable energy facilities are expected to be the main contributors to potential future impacts in this area because of favorable conditions in the area for their development, large acreages required, and potentially large quantities of water used. Thus, this analysis focuses on renewable energy and any other foreseeable large energy projects, nominally covering 500 acres (802 km^2) or more or requiring amounts of water on the scale of utility-scale CSP.

TABLE 9.1.22.2-1 Reasonably Foreseeable Future Actions Related to Energy Development and Distribution and Other Major Actions near the Proposed Imperial East SEZ

Description	Status	Resources Affected	Primary Impact Location
Fast-Track Energy Project on BLM-Administered Land			
Imperial Valley Solar Project (CACA-47740), 750 MW dish engine; 6,500 total acres[a]	Under review; AFC filed June 30, 2008	Land use, visual, terrestrial habitats, wildlife, groundwater	About 35 mi (56 km) west of Imperial East SEZ
Orresource Geothermal (CACA 6217, CACA 6218, CACA 17568)	Ongoing	Land use, terrestrial habitats, visual	About 3 mi (5 km) northwest of Imperial East SEZ, within the East Mesa Known Geothermal Resource Area
Geothermal Power Project (CACA 18092X)	Authorized	Land use, terrestrial habitats, visual	About 5 mi (8 km) northwest of Imperial East SEZ, within the East Mesa Known Geothermal Resource Area
Black Rock 1,2 ,and 3 Geothermal Power Project, 159 MW, 160 acres	Planned, currently on hold	Land use, terrestrial habitats, visual	Northwest Imperial County near Salton Sea and Sonny Bono Salton Sea National Wildlife Refuge
Transmission and Distribution Systems			
Existing Southwest Powerlink 500-kV Transmission Line	Ongoing	Land use, terrestrial habitats, visual	Line runs from the Palo Verde Nuclear Generating Station in Arizona to the San Diego area, passing just to the south of the Imperial East SEZ.
Upgrades to Imperial Irrigation District 230-kV Transmission Line	Planned	Land use, terrestrial habitats, visual	Line would run from the IID/San Diego Gas & Electric's (SDG&E) Imperial Valley Substation approximately 10 mi (16 km) southwest of the City of El Centro and terminate at the El Centro Switching Station.

TABLE 9.1.22.2-1 (Cont.)

Description	Status	Resources Affected	Primary Impact Location
Upgrades for Imperial Valley Solar Project Transmission Line	Planned	Land use, terrestrial habitats, wildlife, visual	Construction of a new 230-kV substation approximately in the center of the Imperial Valley Solar Project site and would connect to the SDG&E Imperial Valley Substation via 10.3-mi (16-km) transmission line.
New Sunrise Powerlink 500-kV Transmission Line	Planned	Land use, terrestrial habitats, wildlife, visual	Line would run westward 150 mi (242 km) from the El Centro area in Imperial County to western San Diego County.
Other Projects			
Imperial Irrigation District Hydroelectric Power Plants	Ongoing	Land use, surface water	Power plants are along the All-American Canal in Imperial County, including locations near Imperial East SEZ.
North Baja Pipeline Expansion Project	Planned	Land use, terrestrial habitats, visual	Gas pipeline would run 80 mi (128 km) from Ehrenberg, Arizona, through Riverside and Imperial Counties to a connection point located between Yuma, Arizona, and Imperial East SEZ.
Proposed West Chocolate Mountains Renewable Energy Evaluation Area	NOI to prepare an EIS issued on Feb 10, 2010	Land use, visual, terrestrial habitats, wildlife, groundwater	About 25 mi (40 km) north of the Imperial East SEZ

[a] Project approved. Updated information will be included in the Final EIS. See http://www.blm.gov/wo/st/en/prog/energy/ renewable_energy/fast-track_renewable.html for details.

Renewable Energy Development

Several recent executive and legislative actions in California have addressed renewable energy development in the state. In November 2008, Governor Schwarzenegger signed E.O. S-14-08 to streamline California's renewable energy project approval process and increase the state's Renewable Portfolio Standard (RPS) to the most aggressive in the nation—at 33% renewable power by 2020. On September 15, 2009, the governor issued a second E.O. requiring that 33% of all electrical energy produced in the state be from renewable energy sources by the year 2020. The E.O. directed the CARB to adopt regulations increasing California's RPS to 33% by 2020.

In 2009, the California Legislature drafted bills requiring that electrical energy production meet a standard of 33% from renewable sources. On October 12, 2009, Governor Schwarzenegger vetoed two bills from the California Legislature on electrical energy generated by renewable sources in favor of an alternative plan that would remove limits on the amount of renewable power utilities could buy from other states (African American Environmentalist Association 2009).

Solar Energy. Table 9.1.22.2-1 lists one foreseeable solar energy project on public land, a so-called fast-track project. Fast-track projects are those on public lands for which the environmental review and public participation process is underway and the ROW applications could be approved by December 2010 (BLM 2010b). The fast-track project is considered foreseeable because the permitting and environmental review processes are under way. The location of this project is shown on Figure 9.1.22.2-1.

- *Imperial Valley Solar Project (CACA 47740).* Formerly named the Stirling Energy Systems Solar Two Project, this proposed fast-track project will use CSP dish engine technology (i.e., SunCatchers) in a facility with an output of 750 MW (BLM and CEC 2010). The project will be constructed in two phases—Phase I with 300 MW followed by Phase II with 450 MW. The proposed project site is located on approximately 6,500 acres (26.3 km^2) of land in Imperial County, of which 6,140 acres (24.8 km^2) are on public land and the remaining 360 acres (1.5 km^2) are on private land. The site is about 14 mi (23 km) west of El Centro, California, and about 35 mi (56 km) west of the Imperial East SEZ.

  The proposed project includes the solar facility, a 230-kV substation at the center of the project site, a 10-mi (16-km) 230-kV transmission line that will connect to the grid at the San Diego Gas & Electric (SDG&E) Imperial Valley Substation, an 112-mi (19-km) water-supply pipeline, and access roads. The upgrades to the transmission lines are described in the Transmission and Distribution section below.

  Construction for the proposed project would begin in 2010 and continue for 40 months, employing about 360 people per month and peaking to 731 people

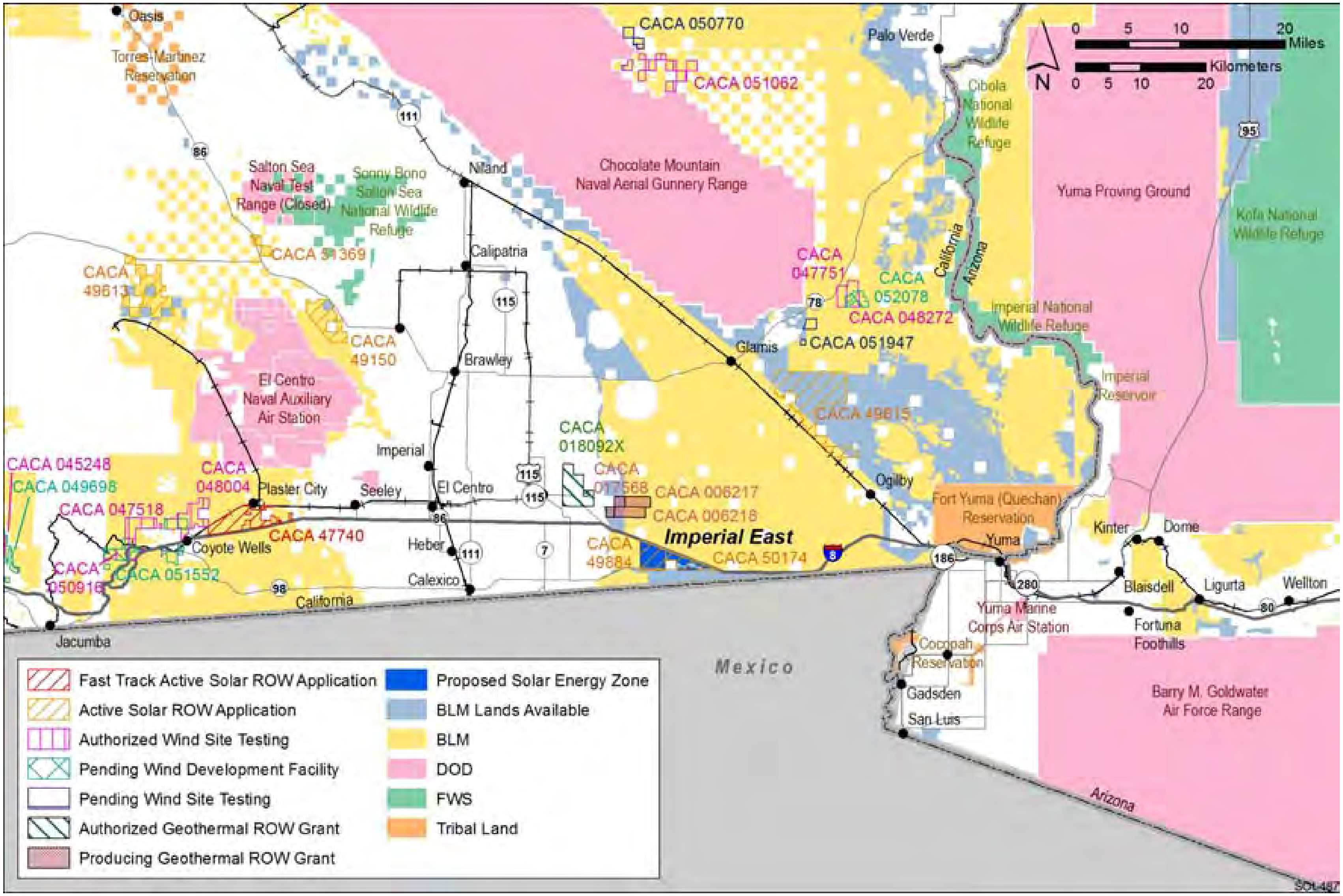

FIGURE 9.1.22.2-1 Locations of Renewable Energy Projects on Public Land within a 50-mi (80-km) Radius of the Proposed Imperial East SEZ

during the seventh month of construction. Operations would require 164 full-time employees.

Special status wildlife species of concern include the flat-tailed horned lizard and the burrowing owl. The proposed facility will have access to at least 150,000 to 200,000 gal (568 to 757 m^3) of reclaimed water per day for use in all construction and operation activities. On the basis of operation 365 days a year, this would amount to the availability of about 170 to 220 ac-ft/yr (210,000 to 272,000 m^3/yr). The proposed water source for mirror washings would be reclaimed water from the Seeley Waste Water Treatment Facility. Upgrades to this existing treatment facility would be funded by Imperial Valley Solar, LLC (BLM and CEC 2010).

- *Pending Solar ROW Applications on BLM-Administered Lands.* In addition to the fast-track solar project described above, a number of regular-track applications for solar project ROWs that have been submitted to the BLM are for projects that would be located either within the Imperial East SEZ or within 50 mi (80 km) of the SEZ (BLM 2010b). Table 9.1.22.2-2 provides a list of all solar projects that had pending applications submitted to BLM as of March 2010. Figure 9.1.22.2-1 shows the locations in these applications.

  Of the six active solar applications listed in Table 9.1.22.2-2, two applications are within the Imperial East SEZ: CACA 49884 encompasses the entire west side of the SEZ, and CACA 50174 encompasses the entire east side of the SEZ. One application (CACA 49615) is located about 20 mi (32 km) northeast of the boundary. Three applications lie within 35 to 50 mi (56 to 80 km) northwest of the boundary—CACA 49150, CACA 49613, and CACA 51369. All of these applications are administered through the El Centro Field Office of BLM.

  The likelihood of any of the regular-track application projects actually being developed is uncertain, but it is generally assumed to be less than that for fast-track applications. The projects are all listed in Table 9.1.22.2-2 for completeness and as an indication of the level of interest in development of solar energy in the region. Some number of these applications would be expected to result in actual projects. Thus, the cumulative impacts of these potential projects are analyzed in their aggregate effects.

Wind Energy. Table 9.1.22.2-2 lists ROW grant applications for two pending wind site testing, seven authorized for wind site testing, and two pending wind development facilities within a 50-mi (80-km) radius of the proposed Imperial East SEZ. As shown in Figure 9.1.22.2-1, the locations of the applications lie generally west and northeast of the Imperial East SEZ. The actual development of all 11 proposals is considered pending, however, since they await authorization of development of wind facilities.

TABLE 9.1.22.2-2 Pending Renewable Energy Project ROW Applications on BLM-Administered Land within 50 mi (80 km) of the Proposed Imperial East SEZ[a]

Serial No.	Project Name	Application Received	Size (acres[b])	MW	Technology	Field Office
Solar Applications						
CACA 49150	BCL & Associates Inc.	July 17, 2007	5,464	500	PV	El Centro
CACA 49613	First Solar Development Inc.	Dec. 3, 2007	7,525	500	PV	El Centro
CACA 49615	Pacific Solar Investments Inc.	Sept. 4, 2007	17,807	1500	PV	El Centro
CACA 49884	Solar Reserve, LLC	April 24, 2008	3,830	100	CSP	El Centro
CACA 50174	LSR Midway, Well LLC	Aug. 11, 2008	2,571	400	CSP	El Centro
CACA 51369	Invenergy Solar Development, LLC	Sept. 16, 2009	1,081	50	PV	El Centro
Wind Applications						
Pending Wind Site Testing						
CACA 50770	–[c]	–	–	–	Wind	–
CACA 51947	L.H. Renewables, LLC	March 10, 2010	9,069	65	Wind	El Centro
Authorized Wind Site Testing		Application Authorized				
CACA 45248	Pacific Wind Development LLC	Sept. 15, 2004	16,355	–	Wind	El Centro
CACA 47518	GreenHunter Wind Energy LLC assigned to Ocotillo Express LLC	Feb. 3, 2009	6,280	–	Wind	El Centro
CACA 47751	Renewergy, LLC	Jan. 23, 2007	11,187	–	Wind	El Centro
CACA 48004	Ocotillo Renewables, LLC	April 26, 2006	3,208	–	Wind	El Centro
CACA 48272	Imperial Wind	Aug. 16, 2010	1,960	–	Wind	El Centro
CACA 50916	Ocotillo Express, LLC	June 11, 2009	8,757	–	Wind	El Centro
CACA 51062	John Deere Renewables, LLC	April 29, 2009	6,256	–	Wind	El Centro
Pending Wind Development Facility						
CACA 51552	Ocotillo Express, LLC	Oct. 09, 2009	14,691	–	Wind	El Centro
CACA 52078	Imperial Wind	May 28, 2010	2,054	–	Wind	El Centro

Footnotes on next page.

TABLE 9.1.22.2-2 (Cont.)

[a] Information taken from pending and authorized wind energy projects listed on the BLM California Desert District Web site (BLM 2010d) and downloaded from *GeoCommunicator* (BLM and USFS 2010a). Total solar acres = 38,278; total solar MW = 3,050; total wind acres and MW not available.

[b] To convert acres to km^2, multiply by 0.004047.

[c] A dash indicates data not available.

The likelihood of any of these regular-track wind projects actually being developed is uncertain; the projects are all listed to give an indication of the level of interest in development of wind energy in the region. Most are in the wind testing stage and are in the process of preparing Environmental Assessments necessary for project approval.

The following paragraph describes the Ocotillo Express Project. This proposed project encompasses multiple applications, including two authorized applications for wind testing (CACA 47518 and CACA 50916).

- *Ocotillo Express Project.* Ocotillo Express LLC acquired GreenHunter Wind Energy, LLC's BLM ROW grant (CACA 47518), an additional adjacent ROW (CACA 50916), and a small amount of private land, together totaling approximately 15,000 acres (61 km^2) of land for a proposed 561-MW wind generation facility. The electricity would flow to the proposed Sunrise Powerlink 500-kV transmission line from Imperial County to San Diego County. The proposed project site is located near Ocotillo, borders the Anza-Borrego Desert State Park, and is about 40 mi (64 km) west of the SEZ.

  The project would be in operation by the end of 2012 and is expected to employ 400 workers over the two-year construction period. Special status wildlife species of concern include the flat-tailed horned lizard and peninsular bighorn sheep. In total, approximately 61.4 ac-ft (76,000 m3) of water would be needed during construction (Anza-Borrego Desert State Park 2010).

Geothermal Energy. Imperial County contains some of the most productive geothermal resource areas in the United States. Within the El Centro FO management area, 118,720 acres (480 km^2) of land are identified as having geothermal resource potential (BLM 2008b). This acreage is divided into seven Known Geothermal Resource Areas: Dunes, East Brawley, East Mesa, Glamis, Heber, Salton Sea, and South Brawley.

Three producing and one authorized geothermal leases are located within a 50-mi (80-km) radius of the proposed Imperial East SEZ, as listed in Table 9.1.22.2-1 and shown in Figure 9.1.22.2-1. These geothermal leases are within 5 mi (8 km) northwest of the SEZ and within the East Mesa KGRA. The producing leases (CACA 6217, CACA 6218, and CACA 17568) are all owned by Orresource Geothermal.

- *Black Rock 1,2, and 3 Geothermal Power Project*. Formerly named the Salton Sea Geothermal Unit 6 Power Project, CE Obsidian Energy, LLC (Applicant) currently possesses a license to construct a geothermal generating plant on an 80-acre (0.3-km^2) site in Imperial County, California. The project was designated as Salton Sea Unit 6 (docket # 02-AFC-2) and was originally granted a license by the California Energy Commission in December 2003 for a 185-MW plant. The original 2003 license was amended in May 2005 to enable the plant to increase its capacity to 215 MW. The applicant petitioned, and the California Energy Commission subsequently granted, an extension to the Salton Sea Unit 6 license, making it effective until December 18, 2011. The applicant is now proposing to amend its license to allow for the construction of three smaller geothermal plants totaling 159 MW net of generating capacity. Both the 185-MW and 215-MW projects proposed using multiple flash geothermal power generating technology, while the amended project proposes single flash technology, which requires less facility infrastructure and produces less waste compared to multiple flash technology.

The three units will be colocated on the same site as the original Salton Sea Unit 6 project and will share various common auxiliary facilities. The site is currently used for agriculture. Land uses in the surrounding area include existing geothermal power facilities, agriculture, and the Sonny Bono Salton Sea National Wildlife Refuge. The original project site covered 80 acres (0.32 km^2) bounded on the north by McKendry Road, on the east by Boyle Road, on the west by Severe Road, and on the south by Peterson Road. The Amended Project includes the original 80-acre (0.32-km^2) site plus an additional 80 acres (0.32 km^2) adjacent to the south, part of which was used for construction support in the original project. The three power plants would be situated generally in the middle of the site, with production well pads on the northern, western, and southern perimeters of the site (CEC 2009b).

Transmission and Distribution

Existing transmission lines near the Imperial East SEZ include the Southwest Powerlink transmission line and the IID Transmission System.

Existing Southwest Powerlink 500-kV Transmission Line. The Southwest Powerlink 500-kV transmission line, extending from the Palo Verde Nuclear Generating Station in Arizona to the San Diego, California, area, crosses just to the south of the Imperial East SEZ close to the United States–Mexico border near the All-American Canal. This line has been in operation since the 1980s.

Upgrades to Imperial Irrigation District 230-kV Transmission Line. The IID high-voltage transmission system includes 1,300 mi (2,093 km) of line in Imperial, Riverside, and San Diego Counties. The IID operates a 115-kV transmission line that crosses the Imperial East SEZ. The IID provides electricity for more than 145,000 customers from hydroelectric power units located on the All-American Canal and from gas-fired power plants (CEC 2010).

In October 2009, IID staff issued a Draft Mitigated Negative Declaration to be considered by the IID Board of Directors in December 2009 on a proposal to upgrade the existing 230-kV "S" line that runs from the IID/SDG&E Imperial Valley Substation located on BLM lands approximately 10 mi (16 km) southwest of the city of El Centro and terminating at the El Centro

Switching Station. The project consists of upgrading an approximate 18 mi (29 km) of 230-kV overhead transmission line by installing approximately 285 new double circuit steel poles, including all existing polymer horizontal insulators, to replace the existing wood poles supporting a single 230-kV circuit. The Draft Mitigated Negative Declaration concluded that impacts of the project would be less than significant if mitigations for the burrowing owl, Yuma clapper rail, and flat-tailed horned lizard are implemented (IID 2009b).

Upgrades for Imperial Valley Solar Project Transmission. This project would include the construction of a new 230-kV substation at the center of the Imperial Valley Solar Project and would connect to the SDG&E Imperial Valley Substation via an approximate 10-mi (16-km), double-circuit, 230-kV transmission line. The transmission line would parallel the Southwest Powerlink transmission line within the designated ROW.

Other than this interconnection transmission line, no new transmission lines or off-site substations would be required for the Phase I construction of Imperial Valley Solar Project. The full Phase II expansion of the solar project would require the construction of the 500-kV Sunrise Powerlink transmission line project proposed by SDG&E (CEC 2008) as described below.

New Sunrise Powerlink 500-kV Transmission Line. In December 2008, the CPUC granted a Certificate of Public Convenience and Necessity to SDG&E to construct and operate the Sunrise Powerlink 500-kV transmission line. The line is scheduled to go into service in late 2012. The line would be a new 500/230-kV transmission line extending westward north and south of I-8 for about 123 mi (198 km) from the Imperial Valley Substation in Imperial County to the western part of San Diego County. The portion of the line in Imperial County is a 500-kV line that extends westward from the Imperial Valley substation to a new 500/230 Suncrest Substation south of I-8 and east of the community of Alpine. The line then proceeds as a 230-kV line north of I-8 into the Sycamore Canyon Substation on the MCAS Miramar (CPUC 2008, 2010).

9.1.22.2.2 Other Actions

Other actions of relevance in the vicinity of the SEZ are as follows:

- *Existing Imperial Irrigation District Hydroelectric Power Plants.* The IID operates 14 hydroelectric power units at 7 locations along the All-American Canal in Imperial County, California (IID 2010b). Two of the seven locations are near the Imperial East SEZ. The All-American Canal draws water from the Colorado River near Yuma, Arizona, that is transported to the Imperial Valley for use primarily for crop irrigation. IID’s installed hydroelectric generation capacity totals 84 MW (GE 2004).

- *North Baja Pipeline Expansion Project*. In October 2007, the Federal Energy Regulatory Commission (FERC) approved a request of North Pipeline LLC to construct an 80-mi (128-km) liquefied natural gas pipeline from Ehrenberg, Arizona, through Riverside and Imperial Counties, California, to a connection point with the Gasoducto Bajanorte Pipeline at the U.S.–Mexico border. The connection point is located between Yuma and the Imperial East SEZ (FERC 2010; BLM 2001b). The portion of the North Baja pipeline that crosses Imperial County is located east of the Imperial East SEZ and near the southeast corner of the Imperial Sand Dunes.

- *Proposed West Chocolate Mountains Renewable Energy Evaluation Area.* In a February 10, 2010 Notice of Intent (NOI) in the *Federal Register*, the BLM El Centro Field Office announced its intent to prepare an EIS to consider an amendment to the CDCA Plan to identify whether 21,300 acres (86.2 km^2) of BLM-administered lands within the West Chocolate Mountains area should be made available for geothermal, solar, or wind energy development. The Evaluation Area lies about 25 mi (40 km) north of the proposed Imperial East SEZ in Riverside County, east of Niland and northeast of El Centro, California. Cumulative impacts at this distance would affect mainly ecological and socioeconomic resources.

9.1.22.3 General Trends

9.1.22.3.1 Population Growth

Table 9.1.22.2-3 presents recent and projected populations in the 50-mi (80-km) radius ROI and in California as a whole. Population in the ROI stood at 387,798 in 2008, having grown at an average annual rate of 3.2% since 2000. Growth rates for the two counties in the ROI were higher than those for California (1.4%) over the same period.

Both counties in the ROI experienced growth in population since 2000; population in Imperial County grew at an annual rate of 3.0% between 2000 and 2008, while in Yuma County, population grew by 3.3% over the same period. The ROI population is expected to increase to 519,735 by 2021 and to 583,043 by 2023 (California Department of Finance 2010).

9.1.22.3.2 Energy Demand

The growth in energy demand is related to population growth through increases in housing, commercial floor space, transportation, manufacturing, and services. With population growth expected in Imperial, Riverside, and San Bernardino Counties between 2006 and 2016, an increase in energy demand is also expected. However, the Energy Information Administration (EIA) projects a decline in per-capita energy use through 2030, mainly because of improvements in energy efficiency and the high cost of oil throughout the projection period. Primary energy consumption in the United States between 2007 and 2030 is expected to grow by about 0.5%

TABLE 9.1.22.2-3 ROI Population for the Proposed Imperial East SEZ

Location	2000	2008[a]	Average Annual Growth Rate, 2000–2008 (%)	2021	2023
Yuma County, Arizona	160,026	207,305	3.3	276,132	285,531
Imperial County, California	142,361	180,493	3.0	243,603	252,512
ROI	302,387	387,798	3.2	519,735	583,043
Arizona	5,130,632	6,622,885	3.2	8,945,447	9,271,163
California	34,105,437	38,129,628	1.4	44,646,420	45,667,413

[a] Data are averages for the period 2006 to 2008.

Sources: U.S. Bureau of the Census (2009d); Arizona Department of Commerce (2010); California Department of Finance (2010).

each year. The fastest growth is projected for the residential, commercial, and industrial sector (RCI), which is expected to grow by about 5% (residential), 0.4% (commercial), and 0.19% (industrial) each year (EIA 2009).

9.1.22.3.3 Water Availability

Water used in the vicinity of the Imperial East SEZ comes primarily from surface water provided by irrigation canals. There are no surface water features on the proposed Imperial East SEZ, but several irrigation canals and small washes are located within the Imperial Valley. The All-American Canal flows along the southern boundary of the proposed SEZ. The canal diverts Colorado River water at the Imperial Dam (located 35 mi [56 km] west of the SEZ) to the agricultural fields of the Imperial Valley to the north and west of the proposed SEZ. Annual average flows in the canal coming out of the Colorado River ranged between 2.8 million and 3.7 million ac-ft/yr (3.5 billion to 4.6 billion m^3/yr) for the period of 1962 to 1992 (USGS 2010b; stream gauge 09527500).

The majority of groundwater wells in the Imperial Valley are used for irrigation and are located in the agricultural portion of the valley (5 mi [8 km] west of the proposed SEZ). Reported groundwater well yields range between 45 and 1,550 gpm (170 and 5,687 L/min) (Loeltz et al. 1975). In 2005, water withdrawals from surface waters and groundwater in Imperial County were 2.4 million ac-ft/yr (2.9 billion m^3/yr), of which 98% came from surface waters and was used primarily for irrigating agricultural fields. The majority of this water is imported into the Imperial Valley from the Colorado River. Total groundwater withdrawal was 46,000 ac-ft/yr (57 million m^3/yr), which was primarily used for irrigation. Municipal and domestic water uses totaled 34,000 ac-ft/yr (42 million m^3/yr), and industrial and thermoelectric power uses totaled 3,000 ac-ft/yr (3.7 million m^3/yr) (Kenny et al. 2009).

Groundwater levels have remained steady in the region for several decades because of relatively constant recharge rates (CDWR 2003). Three USGS wells located in the desert portion of the Imperial Valley also show steady groundwater elevations, ranging from 23 to 47 ft (7 to 14 m) below the surface (USGS 2010b; well numbers 324242115073501, 324340115073401, 324632115011001).

Recharge to the Imperial Valley groundwater basin is primarily through irrigation returns, Colorado River recharge, seepage under unlined canals, surface runoff from surrounding higher elevations, underflow from the Mexicali Valley to the south, and direct runoff and percolation of precipitation (CDWR 2003). Discharge of groundwater is primarily through irrigation withdrawals, losses to streams, and evapotranspiration (Tompson et al. 2008). A groundwater model based on data from 1970 to 1990 suggests that the total recharge by irrigation returns and seepage under canals was 250,000 ac-ft/yr (308 million m^3/yr) and underflow recharge was 173,000 ac-ft/yr (213 million m^3/yr), while total discharge from the basin was 439,000 ac-ft/yr (541 million m^3/yr) (CDWR 2003). Recharge by precipitation runoff and infiltration was estimated to be less than 10,000 ac-ft/yr (12 million m^3/yr) (Loeltz et al. 1975). Recharge from seepage may be overestimated because of a 1980 project that lined a 49-mi (79-km) stretch of the Coachella Canal with concrete and an ongoing project to line 23 mi (37 km) of the All-American Canal, including the reach along the south portion of the proposed Imperial East SEZ, scheduled to be completed in early 2010 (CDWR 2003, 2009; IID 2009a). The lining of that portion of the canal is expected to save 67,700 ac-ft/yr (83.5 million m^3/yr) of water (IID 2009a).

9.1.22.3.4 Climate Change

Global warming continues to affect many desert areas in the southwestern United States with increased temperature and prolonged drought during the past 20 to 30 years. A report on global climate change in the United States prepared on behalf of the National Science and Technology Council by the U.S. Global Research Program documents current temperature and precipitation conditions and historic trends, and projects impacts during the remainder of the twenty-first century through modeling using low and high scenarios of GHG emissions. The report summarizes the science of climate change and the recent and future impacts of climate change on the United States (GCRP 2009). The following excerpts from this report indicate that there has been a trend for increasing global temperature and decrease in annual precipitation in desert regions:

- Average temperature in the United States had increased more than 2ºF (1.1°C) over the period of 1957 to 2007.

- Southern areas, particularly desert regions of southern Arizona and southeastern California have experienced longer drought and are projected to have more severe periods of drought during the remainder of the twenty-first century. Much of the Southwest has experienced drought conditions since 1999. This period represents the most severe drought in 110 years.

- The incidence of wildfires in the western United States has increased in recent decades because of increased drought.

- Temperature increases in the next 20 to 30 years are expected to be strongly correlated with past emissions of heat-trapping gases such as carbon dioxide and methane.

- Many extreme weather events have increased both in frequency and intensity during the last 40 to 50 years. Precipitation and runoff are expected to decrease in the Southwest in spring and summer based on current data and anticipated temperature increases. Water use will increase over the next several decades as the population of southern California grows, resulting in trade-offs between competing uses.

- Climate project models also show a 10 to 20% decline in runoff in California and Nevada for the period of 2041 to 2060 compared with data from 1901 to 1970 used as a baseline.

- In the Southwest average temperatures increased about 1.5°F (0.8°C) in 2000 compared to a baseline period of 1960 to 1979. By the year 2020 temperatures are projected to rise 2 to 3°F (1.1 to 1.7°C) above the 1960 to 1979 baseline.

Increased global temperatures from GHG emissions will likely continue to exacerbate drought in the southern California deserts. The State of California has prepared several reports of climate change impact predictions for the remainder of the twenty-first century that address topics such as economics, ecosystems, water use/availability, impacts of Santa Ana winds, agriculture, timber production, and snowpack. The California climate change portal Web site (http://www.climatechange.ca.gov/publications/cat/index.html) lists the Climate Action Team reports that are submitted to the governor and state legislature. These reports are included as final papers of the CEC's Public Interest Energy Research Program.

9.1.22.4 Cumulative Impacts on Resources

This section addresses potential cumulative impacts in the 5,722-acre (23-km^2) proposed Imperial East SEZ on the basis of the following assumptions: (1) because of the relatively small size of the proposed SEZ (less than 10,000 acres [40.5 km^2]), only one project would be constructed at a time, and (2) maximum total disturbance over 20 years would be about 4,578 acres (18.5 km^2) (80% of the entire proposed SEZ). For purposes of analysis, it is also assumed that no more than 3,000 acres (12.1 km^2) would be disturbed per project annually and 250 acres (1.01 km^2) monthly on the basis of construction schedules planned in current applications. An existing 115-kV transmission line intersects the southwest corner of the SEZ; therefore, for this analysis, the impacts of construction and operation of new transmission lines were not assessed. Regarding site access, because I-8 runs along the northeast border and State Route 98 crosses the SEZ along its southern edge, no major road construction activities outside of the SEZ would be needed for development to occur in the SEZ.

Cumulative impacts that would result in each resource area from the construction, operation, and decommissioning of solar energy development projects within the proposed SEZ when added to other past, present, and reasonably foreseeable future actions described in the previous section are discussed below. At this stage of development, because of the uncertain nature of the future projects in terms of location within the proposed SEZ, size, number, and the types of technology that would be employed, the impacts are discussed qualitatively or semiquantitatively, with ranges given as appropriate. More detailed analyses of cumulative impacts would be performed in the environmental reviews for the specific projects in relation to all other existing and proposed projects in the geographic areas.

9.1.22.4.1 Lands and Realty

The proposed Imperial East SEZ contains BLM-administered lands within a triangle bordered by I-8 and State Route 98 on the north and south, respectively, and by the Lake Cahuilla ACEC on the west. Land within the SEZ is undeveloped. Immediately to the south lie several transmission lines, the All-American Canal and associated facilities, and the international boundary fence. BOR and state lands lie in close proximity to the SEZ, while the general area is rural in character. The IID holds a public water reserve on all lands in the SEZ, while a 2-mi (3-km) wide Section 368 energy corridor covers about 80% of the SEZ.

Construction of utility-scale solar energy facilities within the SEZ would preclude its use for other purposes and would introduce a new and discordant land use to the area. In addition, it is possible that 640 acres (2.6 km^2) of state lands, as well as 980 acres (4 km^2) of Reclamation Withdrawn lands, within the external boundaries of the SEZ could be developed in a similar fashion. The BOR parcel is within in a solar ROW application that includes the eastern half of the SEZ.

Seven solar projects and 11 wind projects with ROW applications totaling over 124,000 acres (502 km^2) are proposed within a 50-mi (80-km) radius of the Imperial East SEZ (see Table 9.1.22.2-2 and Figure 9.1.22.2-1). One of the solar applications is a fast-track project that includes about 6,500 acres (26 km^2) (see Section 9.1.22.2.1). Should this proposed level of development occur along with accompanying transmission lines, roads, and other infrastructure within the geographic extent being considered for this SEZ, the character of the CDCA could be dramatically changed. While development of other renewable energy projects could occur, due to the relatively small size of the SEZ the contribution to cumulative impacts from utility-scale solar projects in the SEZ is expected to be minor.

9.1.22.4.2 Specially Designated Areas and Lands with Wilderness Characteristics

The Imperial Sand Dunes Recreation Area, several ACECs, the Juan Bautista de Anza National Historic Trail, and the All-American Canal Mitigation Wetlands are the only specially designated areas that are in close proximity to the proposed Imperial East SEZ. No significant impacts associated with development of the SEZ were identified. Construction of utility-scale solar energy facilities within the SEZ in combination with potential and likely development of other renewable energy projects, accompanying infrastructure, and other foreseeable developments within the geographic extent of effects would not likely cumulatively contribute to the visual impacts on these specially designated areas. The ACECs adjacent to the SEZ were identified as being potentially susceptible to damage from an increase in the amount of human traffic in or near them, and additional effects from activities away from the SEZ are not likely to contribute to an increase in the level of potential impact.

9.1.22.4.3 Rangeland Resources

The SEZ is not included within a grazing allotment. Therefore, utility-scale solar development would not affect livestock grazing.

Because the proposed Imperial East SEZ is about 20 mi (32 km) or more from the nearest wild horse or burro HMA, solar energy development would not contribute to cumulative impacts on wild horses and burros managed by the BLM.

9.1.22.4.4 Recreation

Because of the nature of the land in the SEZ, there is very little recreation use occurring there; therefore, the impact of solar energy development within the SEZ on recreation use is expected to be minimal and would not contribute significantly to any cumulative loss of recreation opportunities in the geographic area.

9.1.22.4.5 Military and Civilian Aviation

The proposed Imperial East SEZ is entirely covered by two MTRs and an SUA. These are part of a very large, interconnected system of training routes throughout the Southwest. The development of any solar energy or transmission facilities that encroach into the airspace of MTRs would create safety issues and would conflict with military training activities. The DoD has indicated a concern for any facilities taller than 100 ft (30 m) above ground level in this area, which would include power towers. With potential solar development occurring throughout the region, not only in SEZs, maintaining a large-picture view of the overall effects on the system of MTRs will be necessary to avoid cumulative effects.

The Mexicali airport in Mexico about 5 mi (8 km) southwest of the SEZ is the only regional airport close enough to be potentially affected by solar facilities in the SEZ. With mitigations in place, there would be no contribution to cumulative impacts on civilian aviation facilities.

9.1.22.4.6 Soil Resources

Ground-disturbing activities (e.g., grading, excavating, and drilling) during the construction phase of a solar project, including any new associated transmission lines, would contribute to the soil loss due to erosion. Construction of new roads or improvements to existing roads within the SEZ would also contribute to soil erosion. During construction, operations, and decommissioning of the solar facilities, worker travel and other road use would also contribute to soil loss. These losses would be in addition to losses occurring as a result of disturbance caused by other users in the area, including from construction and operation of other new or existing geothermal energy facilities that lie within 10 mi (16 km) to the northwest of the facility (Figure 9.1.22.2-1). As discussed in Section 9.1.7.3, programmatic design features would be employed to minimize erosion and loss of soil during the construction, operation, and decommissioning phases of the solar facilities and any associated transmission lines. Because of the generally low level of soil disturbance activities within the geographic extent of effects and with the expected design features in place, cumulative impacts from the disturbance of soils would be small.

9.1.22.4.7 Minerals (Fluids, Solids, and Geothermal Resources)

No locatable mining claims or oil and gas leases occur within the proposed Imperial East SEZ. Public land in the SEZ was closed in June 2009 to locatable mineral entry pending the outcome of this PEIS. The area remains open for discretionary mineral leasing, including leasing for oil and gas and other salable minerals. About 60% of the SEZ is included within a KGA. There is an operating geothermal plant about 3 mi (2.4 km) northwest of the SEZ.

Solar energy development in the proposed SEZ would foreclose opportunities for future mineral development that would be inconsistent with solar energy facilities as long as they are in place. However, since there are no oil and gas leases in the area nor does the area contain existing mining claims, it is assumed there would be no loss of locatable mineral production there in the future. The impact of the loss of surface development of geothermal resources on 3,462 acres (14 km^2) within the KGRA would be a minor impact, while the cumulative impacts from the solar energy development in the proposed SEZ on mineral resources would be small.

9.1.22.4.8 Water Resources

The water requirements for various technologies if they were to be employed on the proposed SEZ to develop utility-scale solar energy facilities are described in Section 9.1.9.2. If the SEZ were to be fully developed over 80% of its available land area, the amount of water needed during the peak construction year for all evaluated solar technologies would be 1,382 to 2,047 ac-ft (1.9 to 2.5 million m^3), mainly for fugitive dust control. During operations, the amount of water needed for all evaluated solar technologies would range from 26 to 13,746 ac-ft/yr (0.03 to 17 million m^3), with PV representing the lower end of this range. Such water use requirements would be sustainable for technologies using dry-cooling, dish engine, and PV systems. However, water use estimates for wet-cooling technologies could potentially cause groundwater drawdown and could potentially disrupt groundwater flow patterns in the Imperial Valley. Drawdown could worsen land subsidence that has been occurring in the valley and could cause cracks in the newly lined All-American Canal and affect water quantities and rights of the IID (Section 9.1.9.2.2).

There are currently two pending applications for development of a solar energy project within the Imperial East SEZ—applications CACA 49884 and CACA 50174 for proposed 100 MW and 400 MW of CSP, respectively (Figure 9.1.22.2-1 and Table 9.1.22.2-1). While these two applications effectively cover the entire SEZ, their combined output of 500 MW is about one-half the maximum estimated 916-MW build-out capacity of the SEZ based on gross assumptions for output per available acre for solar trough technology. On the basis of technology-specific water use rates (Section 9.1.9) and solar trough technology, the combined facilities could require up to 7,200 ac-ft/yr (8.9 million m^3/yr) if wet cooled, or 500 ac-ft/yr (0.6 million m^3/yr) if dry cooled, assuming 60% operating time in each case. Impacts on the Imperial Valley aquifer could be significant under the wet-cooling scenario, but would be sustainable under the dry-cooling scenario.

While the Imperial aquifer beneath the proposed SEZ is thought to be in equilibrium, balancing current withdrawals with recharge, it is estimated that the newly lined portion of the All-American Canal near the southern boundary of the proposed SEZ will eliminate up to 67,700 ac-ft/yr (83.5 million m^3/yr) of recharge to the aquifer (Section 9.1.9.1.2). In addition, an approved geothermal lease agreement, CACA 018092X, is about 7 mi (11 km) northwest of the proposed SEZ (Figure 9.1.22-1), which could result in further withdrawals from the aquifer for cooling water. Contributions to cumulative impacts on groundwater from solar development in the SEZ should be viewed in the context of groundwater dynamics that are heavily affected by irrigation water returns and leakage from the All-American Canal. In this already highly influenced context, cumulative impacts on groundwater from currently foreseeable projects within the geographic extent of effects are expected to be variable but small overall.

Similarly, with respect to wastewaters, the small quantities of sanitary wastewater that would be generated during the construction and operation of the potential utility-scale solar energy facilities within the proposed Imperial East SEZ in combination with similarly small volumes from other foreseeable projects would not be expected to strain available sanitary wastewater treatment facilities in the general area of the SEZ. Blowdown water from cooling towers for wet-cooled technologies would be treated within a project site (e.g., in settling ponds) and injected into the ground, released to surface water bodies, or reused and thus would not contribute cumulative impacts to any nearby treatment systems.

9.1.22.4.9 Vegetation

The proposed Imperial East SEZ is located within the Sonoran Basin and Range ecoregion (EPA 2007), which supports creosotebush (*Larrea tridentata)*-bur sage (*Ambrosia* sp.) plant communities with large areas of palo verde (*Parkinsonia* sp.) cactus shrub and saguaro cactus (*Carnegiea gigantea*) communities. One wetland mapped by the *National Wetlands Inventory* extends into the south-central portion of the SEZ, south of State Route 98

(USFWS 2009). The wetland is supported by seepage from the All-American Canal, located to the south (Figure 9.1.1.10-2) of the SEZ and is classified as a palustrine wetland with a scrub-shrub plant community that is temporarily flooded. Wetlands within the 5-mi (8-km) indirect impact area include those associated with the canal. If utility-scale solar energy projects were constructed within the SEZ, all vegetation within the footprints of the facilities would likely be removed during land-clearing and land-grading operations. The plant communities affected could include any of the communities occurring on the SEZ.

With respect to other, ongoing actions, a large portion of the Imperial Valley has been converted to agricultural land via irrigation, beginning about 3 mi (5 km) west of the SEZ. This conversion has had the largest overall ongoing impact on vegetation in Imperial County. Past impacts on major cover types located in the central Imperial Valley would have been large due to the extensive land area converted. The major cover type affected would have been the Sonora-Mojave Creosotebush-White Bursage Desert Scrub, which is still dominant in undeveloped areas. In addition, changes in wetland boundaries may occur in some areas subsequent to the lining of portions of the All-American Canal and associated wetland mitigation programs (BOR 2006).

Other renewable energy projects proposed within a 50-mi (80-km) radius of the Imperial East SEZ include two producing geothermal facilities located about 3 mi (5 km) to the north and a third authorized geothermal lease located about 6 mi (10 km) to the northwest of the SEZ. Additionally, there are as many as 7 proposed solar projects and 11 proposed wind projects with pending applications on public land within a 50-mi (80-km) radius of the SEZ, including two solar applications within the SEZ (Section 9.1.22.2 and Figure 9.1.22.2-1). Renewable energy projects, particularly solar, would have the greatest future potential to affect vegetation due to the large acreages that might be cleared. However, only one solar application and no wind applications are located within 20 mi (32 km) of the SEZ. The magnitude of such effects would depend on the actual development of renewable energy projects within and outside the SEZ and accompanying transmission lines, roads, and other infrastructure within the geographic extent of effects.

Since the major cover type present on the SEZ, Sonora-Mojave Creosotebush-White Bursage Desert Scrub, is still abundant within the geographic extent of effects, outside of the agricultural areas, and a relatively small fraction of this area would be further affected by foreseeable actions, cumulative impacts on this cover type from foreseeable developments are expected to be small. Minor cover types, including the dune habitat in the eastern portion of the SEZ and extending eastward, and riparian woodland/shrubland habitats along the southern edge of the SEZ and extending to the All-American Canal could incur greater cumulative impacts due to their sensitivity and the rareness of these cover types within the geographic extent of effects. Programmatic design features would be adopted to protect these areas.

In addition, the cumulative effects of fugitive dust generated during the construction of the solar facilities along with other activities in the area, such as transportation and recreation, could increase the dust loading in habitats outside a solar project area, which could result in reduced productivity or changes in plant community composition. Programmatic design features would be implemented to reduce the impacts from solar energy projects and thus reduce the overall cumulative impacts on plant communities and habitats.

9.1.22.4.10 Wildlife and Aquatic Biota

As many as 158 species of amphibians (1 species), reptiles (27 species), birds (90 species), and mammals (40 species) occur in and around the proposed Imperial East SEZ (Section 9.1.11). The construction of utility-scale solar energy projects in the SEZ and any associated transmission lines and roads in or near the SEZ would have an impact on wildlife through habitat disturbance (i.e., habitat reduction, fragmentation, and alteration), wildlife disturbance, loss of connectivity between natural areas (e.g., habitat fragmentation and blockage of dispersal corridors for bighorn sheep and desert tortoise), and wildlife injury or mortality. In general, impacted species with broad distributions and occurring in a variety of habitats would be less affected than species with a narrowly defined habitat within a restricted area. Programmatic design features include pre-disturbance biological surveys to identify key habitat areas used by wildlife, followed by avoidance or minimization of disturbance to those habitats (e.g., avoiding development in dune and riparian areas).

In addition, up to 7 other solar projects, 11 wind projects, and 1 geothermal project have pending applications on public lands within 50 mi (80 km) of the SEZ, including two within the proposed Imperial East SEZ (Section 9.1.22.2 and Figure 9.1.22.2-1). Renewable energy projects, particularly solar, would have the greatest future potential to affect wildlife due to the large areas covered by such projects. However, only one solar application and no wind applications are within 20 mi (32 km) of the SEZ. The magnitude of cumulative impacts from renewable energy projects would depend on actual development and accompanying transmission lines, roads, and other infrastructure within the geographic extent of effects. Since many of the wildlife species have extensive available habitat within the geographic extent of effects and a relatively small fraction of the area would be affected by foreseeable projects, the cumulative impact on most wildlife species is expected to be small. Programmatic design features would be used to reduce the impacts from solar energy projects and thus reduce the overall cumulative impacts on wildlife. However, cumulative impacts on wildlife species within dune or riparian habitats, such as exist on or near the SEZ, might be somewhat higher due to the sensitivity and scarcity of these habitats.

Similarly, aquatic biota present in wetlands along the southern border of the SEZ, extending southward to the All-American Canal, would be of concern for cumulative impacts. Historically, these wetlands developed only after the construction of the All-American Canal in the 1930s (Cohn 2004) and continue to be supported by water seepage from the canal. Cumulative impacts on these wetlands and associated aquatic biota could occur because of reduction in seepage water supply resulting from lining the canal, drawdown of groundwater by solar facilities, and the possibility of off-site impacts from ground disturbance within the SEZ. Increased future demands on water from the Colorado River, which supplies the All-American Canal, could also affect surface water levels in the canal and, as a consequence wetlands and aquatic organisms. Avoidance of wetlands within the SEZ and off-site and implementation of development best management practices could minimize the effects of ground disturbance on these wetlands. Also, it is assumed that water for solar energy development would not come from the All-American Canal, and therefore water levels in the associated wetlands should not be affected.

9.1.22.4.11 Special Status Species (Threatened, Endangered, Sensitive, and Rare Species)

Six special status species are known to occur within the affected area of the Imperial East SEZ: California black rail, giant Spanish-needle, sand food, flat-tailed horned lizard, Yuma clapper rail, and Yuma hispid cotton rat. The USFWS determined that the desert tortoise is absent from the affected area. The flat-tailed horned lizard, proposed for listing as an ESA-threatened species, is known to occur in the vicinity of the SEZ, while potentially suitable habitat (desert dune and pavement) occurs on the SEZ (Section 9.1.12.1.2). Numerous additional species occurring on or in the vicinity of the SEZ are listed as threatened or endangered by the states of California or Arizona, or listed as a sensitive species by the BLM. Programmatic design features that could reduce or eliminate the potential for cumulative effects on these species from the construction and operation of utility-scale solar energy projects within the geographic extent of effects include avoidance of habitat and minimization of erosion, sedimentation, and dust deposition. In addition, translocation could be used to minimize take of individuals.

A number of reasonably foreseeable future actions are possible in the geographic extent of effects of the proposed Imperial East SEZ, including seven solar and eleven wind project applications. Many of the same sensitive species or suitable habitat identified within or around the Imperial East SEZ would likely occur in or around the proposed locations of these potential projects. The actual species of concern or suitable habitat would be identified in biological surveys that would need to be performed as project applications move forward. Effects on identified species or suitable habitat would be assessed in required environmental reviews. Approved projects in these and other areas would employ design features to reduce or eliminate the impacts on protected species as required by the ESA and other applicable federal and state laws and regulations.

Depending on the number and size of other projects that will be built within the next 20 to 30 years in the geographic extent of effects, there could be cumulative impacts on protected species due to habitat destruction and overall development and fragmentation of the area. Habitats that are particularly at risk are the dune, wetland, and riparian woodland habitats present on the Imperial East SEZ, which are scarce habitats sensitive to the effects of development. Most of the identified foreseeable actions are located more than 20 mi (32 km) from the SEZ and would not affect substantial portions of sensitive habitats present on or near the SEZ. Thus cumulative impacts from such future projects are expected to be small. However, considering habitat loss from the conversion of much of the central Imperial Valley to agriculture, total cumulative impacts on sensitive species from past and future actions could be moderate.

9.1.22.4.12 Air Quality and Climate

While solar energy generates minimal emissions compared with fossil fuels, the site preparation and construction activities associated with solar energy facilities would produce some emissions, mainly particulate matter (fugitive dust) and emissions from vehicles and construction equipment. When these emissions are combined with those from other projects near solar energy development or when they are added to natural dust generation from winds and windstorms, the air quality in the general vicinity of the projects could be temporarily degraded. For example, particulate matter (dust) concentration at or near the SEZ boundaries could at times exceed state or federal ambient air quality standards. The dust generation from the construction activities can be controlled by implementing aggressive dust control measures, such as increased watering frequency, or road paving or treatment.

Several other renewable energy projects are proposed or planned within the air basin shared by the proposed Imperial East SEZ (Section 9.1.22.2.1 and Figure 9.1.22.2-1). A total of 7 solar and 11 wind proposals are pending within 50 mi (80 km) of the Imperial East SEZ. These projects potentially in combination with others with pending applications could produce periods of elevated particulate emissions within the 50-mi (80-km) geographic extent of effects. Since the proposed solar projects, which involve the greatest area of ground disturbance, are more than 20 mi (32 km) from the proposed Imperial East SEZ and are widely separated, cumulative impacts are expected to be small.

Over the long term and across the region, the development of solar energy may have beneficial cumulative impacts on the air quality and atmospheric values in southern California by offsetting the need for energy production from fossil fuels that results in higher levels of emissions. As discussed in Section 9.1.13, air emissions from operating solar energy facilities are relatively minor, while the displacement of criteria air pollutant, VOC, TAP, and GHG emissions currently produced from fossil fuels could be relative large. For example, if the Imperial East SEZ were fully developed with solar facilities over up to 80% of its area, the quantity of pollutants avoided could be up to 1.5% of all emissions from the current electric power systems in California.

9.1.22.4.13 Visual Resources

The Imperial Valley is flat and is characterized by wide-open views. A lack of obstructions allow visibility for 50 mi (80 km) or more under favorable atmospheric conditions, while occasional poor air quality can limit visibility. The SEZ presents a flat, open landscape, mostly treeless, but with shrubs tall enough in some areas to provide partial screening of views. The landscape is visually dominated by the strong horizon line; the closest visible mountain ranges are too far away to significantly affect the visual values in the vicinity of the SEZ. Cultural modifications on and around the site detract markedly from its scenic quality. These distractions include the presence of major and minor roads, transmission lines, communications towers, and the All-American Canal and its associated infrastructure. The VRI values for the SEZ and immediate surroundings are VRI Class III, indicating moderate relative visual values, and VRI Class IV, indicating low relative visual values. The inventory indicates low scenic quality for the SEZ and its immediate surroundings, with moderate sensitivity for the SEZ and its immediate surroundings (Section 9.1.14.1).

Development of utility-scale solar energy projects within the SEZ would contribute to the cumulative visual impacts in the general vicinity of the SEZ. However, the exact nature of the visual impact and the design features that would be appropriate would depend on the specific project locations within the SEZ and on the solar technologies used for the project. Such impacts and potential design features would be considered in visual analyses conducted for future specific projects. In general, large visual impacts on the SEZ would be expected to occur as a result of the construction, operation, and decommissioning of utility-scale solar energy projects. These impacts would be expected to involve major modification of the existing character of the landscape and could dominate the views for some nearby viewers. Additional impacts would occur as a result of the construction, operation, and decommissioning of related facilities, such as access roads and electric transmission lines.

Because of the large size of utility-scale solar energy development, other pending renewable energy applications on public lands in the area, and the generally flat, open nature of the proposed SEZ, some lands outside the SEZ would also be subjected to visual impacts related to the construction, operation, and decommissioning of utility-scale solar energy development. Potential impacts would include night sky pollution, including increased skyglow, light spillage, and glare. Some of the affected lands outside the SEZ would include potentially sensitive scenic resource areas, including the North Algodones Dunes scenic ACECs. Other sensitive visual resource areas, including a congressionally designated WA, national historic trail, the CDCA, and I-8 and State Route 98, would be subject to mostly minor or minimal visual impacts. Visual impacts resulting from solar energy development within the SEZ would be in addition to impacts caused by other potential projects in the area, such as other solar facilities on private lands, transmission lines, and other renewable energy facilities, including windmills. The presence of new facilities would normally be accompanied by increased numbers of workers in the area, traffic on local roadways, and support facilities, all of which would add to cumulative visual impacts.

As many as 7 other solar projects and 11 wind projects have pending applications on public lands within 50 mi (80 km) of the SEZ. The overall extent of cumulative effects of renewable energy development in the area would depend on the number of projects that actually are built. However, since most of the pending applications would be more than 20 mi (32 km) from the proposed SEZ, it may be concluded that the general visual character of the landscape within the geographic extent of effects would not be fundamentally altered. Locally, the SEZ would be transformed from primarily rural desert to utility-scale solar development. The facilities would also be viewable by motorists on I-8 and State Route 98, as well as from the sensitive areas mentioned above. Views from these locations are currently visually affected by transmission line corridors, the All-American Canal, towns, and other infrastructure, as well as the road system itself. Thus, cumulative visual impacts in the region from future solar and other renewable energy development in the region would be small, while total impacts, including those from past developments, would be moderate, due to the moderate visual sensitivity of the region.

In addition to cumulative visual impacts associated with views of particular future development, as additional facilities are added several projects might become visible from one location, or in succession, as viewers move through the landscape, such as driving on local roads. In general, the new developments would vary in appearance, and depending on the number and type of facilities, the resulting visual disharmony could add to the cumulative visual impact.

9.1.22.4.14 Acoustic Environment

The areas around the proposed Imperial East SEZ and in Imperial County, in general, are relatively quiet. The existing noise sources include road traffic from I-8 and State Route 98, industrial activities at hydroelectric power plants and geothermal facilities, agricultural activities, activities and events at nearby communities, and aircraft flyovers, including military, commercial, and private airplanes, crop dusters, and Border Patrol helicopters. The construction of solar energy facilities could increase the noise levels over short durations because of the noise generated by construction equipment during the day. After the facilities are constructed and begin operating, there would be little or minor noise impacts for any of the technologies except from solar dish engine facilities and from parabolic trough or power tower facilities using TES. It is possible that residents could be cumulatively affected by more than one solar or other development built in close proximity of the SEZ, particularly at night when the noise is more discernable because of relatively low background levels. However, such cumulative impacts are unlikely due to attenuation of noise with distance and the sparse population of the region.

9.1.22.4.15 Paleontological Resources

The potential for impacts on significant paleontological resources at the Imperial East SEZ in Imperial Valley is unknown. The specific sites selected for future projects would be surveyed if determined necessary by the BLM, and paleontological resources encountered would be avoided or mitigated to the extent possible. A similar process would be employed at other foreseeable developments in the area, and no significant cumulative impacts on paleontological resources are expected.

9.1.22.4.16 Cultural Resources

While much of the proposed Imperial East SEZ has not been surveyed for cultural resources, the area along the All-American Canal south of the SEZ has been found to contain a high density of both prehistoric and historic cultural remains, and the canal itself is an important historic resource. Direct impacts on significant cultural resources during site preparation and construction activities could occur in the SEZ; however, further investigation would be needed, including a cultural resource survey of the entire area of potential effect to identify historic properties (i.e., cultural resources eligible for listing in the NRHP). It is possible that the development of utility-scale solar energy projects in the SEZ, when added to other potential projects likely to occur in the area, could contribute cumulatively to cultural resource impacts. However, historic properties would be avoided or mitigated to the extent possible in accordance with state and federal regulations. Similarly, through ongoing consultation with the California SHPO and appropriate Native American governments, it is likely that most adverse effects on significant cultural resources within the geographic extent of effects could be mitigated to some degree. However, avoidance of all historic properties and mitigation of all adverse effects on historic properties may not be possible.

9.1.22.4.17 Native American Concerns

Government-to-government consultation has been initiated with federally recognized Tribes whose traditional use areas include the Imperial East SEZ area in order to identify Tribal concerns regarding solar energy development within the SEZ. Among their concerns is the impairment of culturally and religiously important landscapes, and adverse effects on culturally important native plant and game species. It is likely that the development of utility-scale solar energy projects within the SEZ, when added to other potential projects likely to occur in the area, including renewable energy projects outside the SEZ, would contribute cumulatively to visual impacts on their traditional landscape and the destruction of other resources in the valley important to Native Americans. Continued government-to-government consultation with area Tribes is necessary to effectively consider and address the cumulative impacts of solar energy development in the Imperial East SEZ on resources important to Tribes.

9.1.22.4.18 Socioeconomics

Solar energy development projects in the proposed Imperial East SEZ could cumulatively contribute to socioeconomic effects in the immediate vicinity of the SEZs and in the surrounding multicounty ROI. The effects could be positive (e.g., creation of jobs and generation of extra income, increased revenues to local governmental organizations through additional taxes paid by the developers and workers) or negative (e.g., added strain on social institutions such as schools, police protection, and health care facilities). Impacts from solar development would be most intense during facility construction, but of greatest duration during operations. Construction would temporarily increase the number of workers in the area needing housing and services in combination with temporary workers involved in other new projects in the area, including other renewable energy projects. The number of workers involved in the construction of solar projects in the peak construction year could range from about 130 to 1,680, depending on the technology being employed, with solar PV facilities at the low end and solar trough facilities at the high end. The total number of jobs created in the area could range from approximately 210 (solar PV) to as high as 2,830 (solar trough).

Cumulative socioeconomic effects in the ROI from construction of solar facilities would occur to the extent that multiple construction projects of any type were occurring at the same time. It is a reasonable expectation that this condition would occur within a 50-mi (80-km) radius of the SEZ occasionally over the 20-year or more solar development period. Potential future projects within the geographic extent of effects, including those with pending applications on public land (Section 9.1.22.2.1), would employ additional construction workers within the next several years. These new workers are not likely strain local resources given their wide geographic distribution.

Annual impacts during the operation of solar facilities would be less, but of 20- to 30-year duration, and could combine with those from other new projects in the area. The number of workers needed at the solar facilities within the SEZ would be in the range of 10 to 200, with approximately 13 to 290 total jobs created in the region. Additional operation workers would be needed at other future renewable energy projects in the geographic extent of effects, including those with pending applications on public land (Section 9.1.22.2.1). Population increases resulting from renewable energy development within 50 mi (80 km) of the Imperial East SEZ would contribute to general population growth trends in the region in recent years. The socioeconomic impacts overall would be positive, through the creation of additional jobs and income. The negative impacts, including some short-term disruption of rural community quality of life, would not likely be considered large enough to require specific mitigation measures.

9.1.22.4.19 Environmental Justice

Minority populations but no low-income populations have been identified within 50 mi (80 km) of the proposed SEZ in either California or Arizona, as defined under CEQ guidelines. However, it is not expected that solar development within the proposed Imperial East SEZ would contribute to cumulative impacts on minority populations.

9.1.22.4.20 Transportation

During construction activities, there could be up to 1,000 workers commuting to a single construction site at the SEZ, which could double the daily traffic load on State Route 98 near the junction with I-8 at the eastern end of the SEZ and have small to moderate cumulative impacts in combination with existing traffic levels and increases from additional future projects in the area. Local road improvements may be necessary near site access points. Any impacts from construction activities would be temporary. Traffic increases during operation would be reduced because of the lower number of workers needed to operate solar facilities and would have a smaller contribution to cumulative impacts.

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9.1.23 References

Note to Reader: This list of references identifies Web pages and associated URLs where reference data were obtained for the analyses presented in this PEIS. It is likely that at the time of publication of this PEIS, some of these Web pages may no longer be available or their URL addresses may have changed. The original information has been retained and is available through the Public Information Docket for this PEIS.

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9.2 IRON MOUNTAIN

9.2.1 Background and Summary of Impacts

9.2.1.1 General Information

The proposed Iron Mountain SEZ has a total area of 106,522 acres (431 km^2) and is located in San Bernardino County in southeastern California, about 20 mi (32 km) west of the Arizona border (Figure 9.2.1.1-1). In 2008, the county population was 2,086,465, while the two-county region surrounding the SEZ—San Bernardino and Riverside Counties—had a total population of 4,189,515. Several mid-sized cities lie near the SEZ, including San Bernardino, Fontana, Ontario, Rancho Cucamonga, and Victorville in San Bernardino County, and Riverside and Moreno Valley in Riverside County. U.S. 95 runs north–south about 15 mi (24 km) to the east of the proposed SEZ, while State Route 62, a two-lane highway, passes through its southern edge. Los Angeles to the west and Phoenix to the southeast are each about 220 mi (355 km) away via I-10, which runs east–west approximately 31 mi (50 km) south of the Iron Mountain SEZ. The Arizona and California (ARZC) Railroad serves the area and traverses the SEZ from the northwest to the southeast, roughly bisecting the SEZ. The Cadiz Road is an unpaved road adjacent to and paralleling the railroad. Three small public airports are within approximately 85 mi (137 km) of the SEZ.

A 230-kV transmission line runs north–south through the western portion of the SEZ. It is assumed that this existing 230-kV transmission line could potentially provide access from the SEZ to the transmission grid (see Section 9.2.1.2). As of February 2010, five solar project applications were pending in the SEZ. Active pending renewable energy applications within the SEZ are described in Section 9.2.22 and are shown in Figure 9.2.22.2-1. Figure 9.2.22.2-1 also shows several large areas of active pending solar ROW applications on BLM-administered lands to the west-northwest of the proposed SEZ.

The proposed Iron Mountain SEZ lies in Ward Valley, a broad valley within the California Desert Conservation Area within the Mojave Desert. Ward Valley lies in the Basin and Range physiographic province and is bounded by the Turtle Mountains to the east and the Iron Mountains to the west; surface elevations range from 600 to 1650 ft (183 to 503 m) and lower elevations occur near the center of the valley. The Old Woman Mountains and the Palen-McCoy WAs, with some peaks higher than 5,000 ft (1,524 m), also lie nearby. The region is characterized by wide daily temperature extremes and low precipitation and humidity. Annual precipitation amounts increase with elevation, from 3.6 in. (9 cm) in the valleys up to 12 in. (30.5 cm) in the mountains. Danby Lake (also known as Danby Dry Lake), which covers approximately 31.5 mi^2 (81.5 km^2) of the northwestern portion of the proposed SEZ (Figure 9.2.1.1-1), is an internal drainage area for the Ward Valley and a region of active soda mining that can be inundated intermittently throughout the year because of natural drainage. The valley floor slopes gently toward Danby Lake in all directions. The Ward Valley groundwater basin underlies the area. The abandoned town of Milligan is located in the northwest corner of

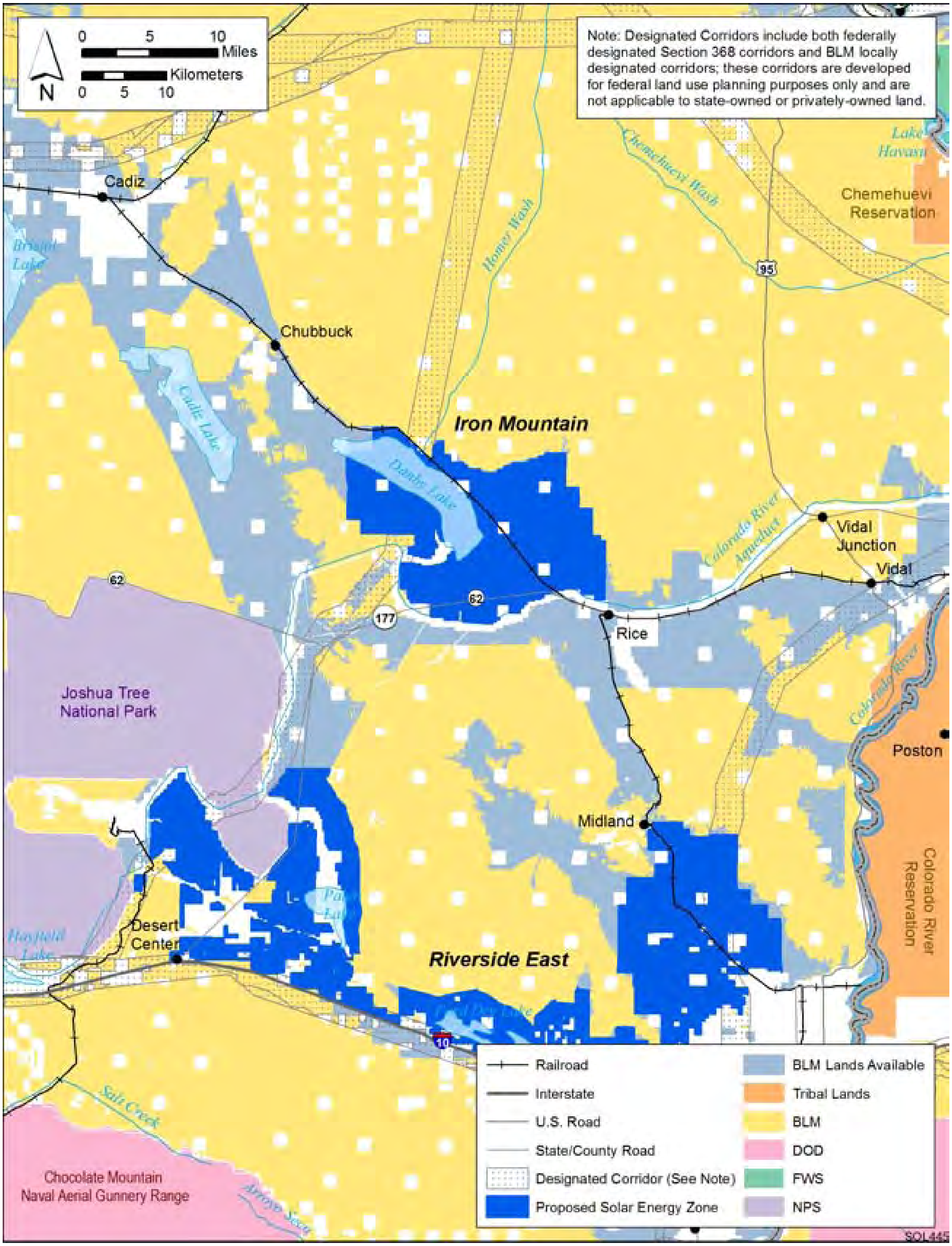

FIGURE 9.2.1.1-1 Proposed Iron Mountain SEZ

the SEZ, and trailers used by sodium lease operators working an active sodium lease are located approximately 1.3 mi (2.2 km) east of Milligan on Cadiz Road. The Metropolitan Water District Aqueduct is located on the south and west sides of the SEZ. Three WWII Military Divisional Camps started by General Patton border the Iron Mountain SEZ. The Iron Mountain Divisional Camp is an ACEC eligible for listing on the NRHP and is the best preserved camp in California. Scrubland vegetation throughout the area reflects the arid climate.

The proposed Iron Mountain SEZ and other relevant information are shown in Figure 9.2.1.1-1. The criteria used to identify the SEZ as an appropriate location for solar development included proximity to existing transmission lines or designated corridors, proximity to existing roads, a slope of generally less than 2%, and an area of more than 2,500 acres (10 km^2). In addition, the area was identified as being relatively free of other types of conflicts, such as USFWS-designated critical habitat for threatened and endangered species, ACECs, SRMAs, and NLCS lands (see Section 2.2.2.2 for the complete list of exclusions). Although these classes of restricted lands were excluded from the proposed Iron Mountain SEZ, other restrictions might be appropriate. The analyses in the following sections address the affected environment and potential impacts associated with utility-scale solar energy development in the proposed SEZ for important environmental, cultural, and socioeconomic resources.

As initially announced in the *Federal Register* on June 30, 2009, the proposed Iron Mountain SEZ encompassed 109,642 acres (444 km^2). Subsequent to the study area scoping period, the Iron Mountain SEZ boundaries were altered somewhat to facilitate BLM's administration of the SEZ area. Borders with irregularly shaped boundaries were adjusted to match the section boundaries of the Public Lands Survey System (PLSS) (BLM and USFS 2010a). Some small higher slope areas internal to and at the borders of the site were also added to the SEZ; although included in the SEZ, these higher slope areas would not likely be utilized for solar facilities. The revised SEZ is approximately 3,100 acres (15 km^2) smaller than the original SEZ as published in June 2009.

9.2.1.2 Development Assumptions for the Impact Analysis

Maximum development of the proposed Iron Mountain SEZ was assumed to be 80% of the total SEZ area over a period of 20 years, a maximum of 85,217 acres (345 km^2). These values are shown in Table 9.2.1.2-1, along with other development assumptions. Full development of the Iron Mountain SEZ would allow development of facilities with an estimated total of 9,469 MW of electrical power capacity if power tower, dish engine, or PV technologies were used, assuming 9 acres/MW (0.04 km^2/MW) of land required, and an estimated 17,043 MW of power if solar trough technologies were used, assuming 5 acres/MW (0.02 km^2/MW) of land required.

Availability of transmission from SEZs to load centers will be an important consideration for future development in SEZs. The nearest existing transmission line is a 230-kV line that runs through the SEZ. It is possible that this existing line could be used to provide access from the SEZ to the transmission grid, but the 230-kV capacity of that line would be inadequate for 9,469 to 17,043 MW of new capacity (note that a 500-kV line can accommodate approximately

TABLE 9.2.1.2-1 Proposed Iron Mountain SEZ—Assumed Development Acreages, Maximum Solar MW Output, Access Roads, and Transmission Line ROWs

Total Acreage and 80% of Acreage	Maximum Output for Various Solar Technologies	Distance to Nearest State, U.S., or Interstate Highway	Distance and Capacity of Nearest Existing Transmission Line	Assumed Area of Transmission Line ROW and Road ROW	Distance to Nearest Designated Transmission Corridor[d]
106,522 acres and 85,217 acres[a]	9,469 MW[b] 17,043 MW[c]	Adjacent (State Route 62)	Adjacent and 230 kV	0 acres and 0 acres	Adjacent to SEZ[e]

[a] To convert acres to km^2, multiply by 0.004047.

[b] Maximum power output if the SEZ were fully developed using power tower, dish engine, or PV technologies, assuming 9 acres/MW (0.04 km^2/MW) of land required.

[c] Maximum power output if the SEZ were fully developed using solar trough technologies, assuming 5 acres/MW (0.02 km^2/MW) of land required.

[d] BLM-designated corridors are developed for federal land use planning purposes only and are not applicable to state-owned or privately owned land.

[e] A Section 368 federally designated 2-mi (3-km) wide energy corridor runs through the western portion of the SEZ.

the load of one 700-MW facility). At full build-out capacity of the proposed Iron Mountain SEZ, it is clear that substantial new transmission and/or upgrades of existing transmission lines would be required to bring electricity from the SEZ to load centers; however, at this time the location and size of such new transmission facilities are unknown. Generic impacts of transmission and associated infrastructure construction and of line upgrades for various resources are discussed in Chapter 5. Project-specific analyses would need to identify the specific impacts of new transmission construction and line upgrades for any projects proposed within the SEZ.

For the analysis in this PEIS, it was assumed that the existing 230-kV transmission line that runs north–south through the western portion of the SEZ could provide access to the transmission grid, and thus no additional acreage disturbance for transmission line access was assessed. Access to the transmission line was assumed, without additional information on whether this line would be available for connection of future solar facilities. If a connecting transmission line were constructed in the future to connect facilities within the SEZ to a different off-site grid location from the one assumed here, site developers would need to determine the impacts from construction and operation of that line. In addition, developers would need to determine the impacts of line upgrades if they were needed.

Existing road access to the proposed Iron Mountain SEZ should be adequate to support construction and operation of solar facilities, because State Route 62, a two-lane highway, passes through the southern edge the SEZ. Thus, no additional road construction outside of the SEZ is assumed to be required to support solar development.

9.2.1.3 Summary of Major Impacts and SEZ-Specific Design Features

In this section, the impacts and SEZ-specific design features assessed in Sections 9.2.2 through 9.2.21 for the proposed Iron Mountain SEZ are summarized in tabular form. Table 9.2.1.3-1 is a comprehensive list of the impacts discussed in these sections; the reader may reference the applicable sections for detailed support of the impact assessment. Section 9.2.22 discusses potential cumulative impacts from solar energy development in the proposed SEZ.

Only those design features specific to the Iron Mountain SEZ are included in Sections 9.2.2 through 9.2.21 and in the summary table. The detailed programmatic design features for each resource area to be required under BLM's Solar Energy Program are presented in Appendix A, Section A.2.2. These programmatic design features would also be required for development in this and other SEZs.

TABLE 9.2.1.3-1 Summary of Impacts of Solar Energy Development within the Proposed Iron Mountain SEZ and SEZ-Specific Design Features[a]

Resource Area	Environmental Impacts—Proposed Iron Mountain SEZ	SEZ-Specific Design Features
Lands and Realty	Full development of the SEZ for utility-scale solar energy production (80% of the total area) could disturb up to 85,217 acres (35 km^2) and would establish a large industrial area that would exclude many existing and potential uses of the land, perhaps in perpetuity. Since the SEZ is largely undeveloped and rural, utility-scale solar energy development would be a new and discordant land use to the area.	None.
	A total of 1,200 acres (5 km^2) of state lands and approximately 2,400 acres (10 km^2) of private lands located within or adjacent to the exterior boundaries of the SEZ could be developed in a similar or complementary manner to the public lands with the landowners' permission. Development of additional industrial or support activities also could be induced on additional private and state lands near the SEZ.	None.
	Cadiz Road provides access through the SEZ and would likely remain open under any development scenario; however, access to the east of the SEZ toward the Turtle Mountains could be obstructed by solar development.	None.
	There is a potential hazard associated with unexploded military ordnance that could remain on the SEZ from past military training activities.	Survey of solar energy development sites for possible unexploded military ordnance would be required.
Specially Designated Areas and Lands with Wilderness Characteristics	Wilderness characteristics within the Turtle Mountains, Old Woman Mountains, and Palen-McCoy WAs would be adversely affected by solar development within the SEZ. Scenic resources in the Turtle Mountains ACEC would also be adversely affected.	Application of SEZ-specific design features for visual resource impacts (Section 9.2.14) may reduce the visual impact on wilderness characteristics, scenic resources, and on night sky viewing opportunities.
	Solar facility development in the SEZ could adversely affect the quality of the night sky environment as viewed from Joshua Tree NP.	None.

TABLE 9.2.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Iron Mountain SEZ	SEZ-Specific Design Features
Rangeland Resources: Livestock Grazing	None.	None.
Rangeland Resources: Wild Horses and Burros	None.	None.
Recreation	Recreational users would lose the use of any portions of the SEZ developed for solar energy production. Because of the impacts of a large and highly visible industrial type of development in the SEZ, opportunities for an undeveloped and primitive recreation experience in and around the SEZ would be lost or reduced.	None.
	Wilderness recreation use in the Turtle Mountains, Old Woman Mountains, and Palen-McCoy WAs would likely be adversely affected.	None.
	Development of solar facilities in the SEZ and in adjacent areas currently under solar application would cause the loss of the expansive and undeveloped viewshed over a very large area.	None.
Military and Civilian Aviation	The development of any solar energy or transmission facilities that encroach into the airspace of MTRs would create safety issues and would conflict with military training activities.	None.
Geologic Setting and Soil Resources	Impacts on soil resources would occur mainly as a result of ground-disturbing activities (e.g., grading, excavating, and drilling) during the construction phase. Impacts include soil compaction, soil horizon mixing, soil erosion and deposition by wind, soil erosion by water and surface runoff, sedimentation, and soil contamination. These impacts may be impacting factors for other resources (e.g., air quality, water quality, and vegetation). Danby Lake may not be a suitable location for construction.	None.

TABLE 9.2.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Iron Mountain SEZ	SEZ-Specific Design Features
Minerals (fluids, solids, and geothermal resources)	Designation of the SEZ would affect the Danby Lake KSLA in the northwest corner of the SEZ. About 23,000 acres (93 km^2) of the KSLA is within the boundary of the SEZ and there are three active and two pending sodium leases which are prior existing rights.	The presence of the KSLA must be addressed to evaluate the compatibility of solar development in the KSLA with continuation of sodium mineral leasing. Alternatively, the KSLA could be excluded from the SEZ.
	Designation of the SEZ could make sand and gravel resources unavailable.	Planning and identification for retention of sand and gravel resources within the SEZ should be completed prior to authorization of solar energy leases.
Water Resources	Ground-disturbance activities (affecting 8% of the total area in the peak construction year) could affect surface water quality due to surface runoff, sediment erosion, and contaminant spills. Construction activities may require up to 6,813 ac-ft (8.4 million m^3) of water during peak construction year. Construction activities would generate as much as 222 ac-ft (273,800 m^3) of sanitary wastewater. Assuming full development of the SEZ, the following amounts of water would be used during operations: ▪ For parabolic trough facilities (17,044-MW capacity), 12,170 to 25,805 ac-ft/yr (15.0 million to 31.8 million m^3/yr) for dry-cooled systems (wet cooling not feasible with respect to water requirements); • For power tower facilities (9,469-MW capacity), 6,734 to 14,309 ac-ft/yr (8.3 million to 17.6 million m^3/yr) for dry-cooled systems (wet cooling not feasible with respect to water requirements);	Water resource analysis indicates that wet-cooling options would not be feasible. Other technologies should incorporate water conservation measures. Land disturbance activities should avoid impacts to the extent possible in the vicinity of Danby Lake to reduce impacts on the regional drainage outlet and salt-mining operations. During site characterization, hydrologic investigations would need to identify 100-year floodplains and potential jurisdictional water bodies subject to Clean Water Act Section 404 permitting. Siting of solar facilities and construction activities should avoid areas identified as within a 100-year floodplain. During site characterization, coordination and permitting with CDFG regarding California's Lake and Streambed Alteration Program would be required for any proposed alterations to surface water features (both perennial and ephemeral).

TABLE 9.2.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Iron Mountain SEZ	SEZ-Specific Design Features
Water Resources *(Cont.)*	• For dish engine facilities (9,469-MW capacity), 4,840 ac-ft/yr (6.0 million m^3/yr); and ▪ For PV facilities (9,469-MW capacity), 484 ac-ft/yr (597,000 m^3/yr). Assuming full development of the SEZ, operations would generate up to 239 ac-ft/yr (294,800 m^3/yr) of sanitary wastewater and up to 4,842 ac-ft/yr (6.0 million m^3/yr) of blowdown water.	The groundwater-permitting process should be in compliance with the San Bernardino County groundwater ordinance. Construction of groundwater production wells in the Danby Lake region should be avoided because the water is nonpotable and contains corrosive levels of TDS. Groundwater monitoring and production wells should be constructed in accordance with standards set forth by the State of California and San Bernardino County. Stormwater management plans and BMPs should comply with standards developed by the California Stormwater Quality Association. Water for potable uses would have to meet or be treated to meet the water quality standards in the California Safe Drinking Water Act.
	Hydrology disturbances near Danby Lake could cause localized flooding and erosion, affect groundwater recharge and discharge processes, and disrupt salt-mining operations. High TDS values of groundwater near the Danby Lake region could produce water that is nonpotable and corrosive to infrastructure.	

TABLE 9.2.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Iron Mountain SEZ	SEZ-Specific Design Features
Vegetation[b]	Up to 80% (85,217 acres [345 km^2]) of the SEZ would be cleared of vegetation; re-establishment of shrub communities in disturbed areas would likely be very difficult because of the arid conditions. Sand dune, playa, desert chenopod scrub, riparian, and dry wash communities are important sensitive habitats within the SEZ that could be affected. Noxious weeds could become established in disturbed areas and colonize adjacent undisturbed habitats, thus reducing restoration success and potentially resulting in widespread habitat degradation. The deposition of fugitive dust from disturbed soil areas in habitats outside the SEZ area could result in reduced productivity or changes in plant community composition. Groundwater withdrawals could affect riparian areas or groundwater-dependent communities, such as mesquite bosque.	An Integrated Vegetation Management Plan, addressing invasive species control, and an Ecological Resources Mitigation and Monitoring Plan, addressing habitat restoration should be approved and implemented to increase the potential for successful restoration of affected Sonoran Desert habitats and to minimize the potential for the spread of invasive species, such as tamarisk, cheatgrass, and sahara mustard. Invasive species control should focus on biological and mechanical methods where possible to reduce the use of herbicides. Riparian, playa, chenopod scrub, sand dune, and desert dry wash habitats should be avoided to the extent practicable, and any impacts should be minimized and mitigated. A buffer area should be maintained around riparian areas, playas, and dry washes to reduce the potential for impacts on these habitats on or near the SEZ. Appropriate engineering controls should be used to minimize impacts on these areas resulting from surface water runoff, erosion, sedimentation, altered hydrology, accidental spills, or fugitive dust deposition to these habitats. Appropriate buffers and engineering controls would be determined through agency consultation. Groundwater withdrawals should be limited to reduce the potential for indirect impacts on riparian habitat that is associated with groundwater discharge or groundwater-dependent communities, such as mesquite bosque.

TABLE 9.2.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Iron Mountain SEZ	SEZ-Specific Design Features
Wildlife: Amphibians and Reptiles[b]	The red-spotted toad is the main amphibian expected to occur within the Iron Mountain SEZ, but its occurrence within the SEZ would be spatially limited. Several other amphibian species could inhabit the Colorado River Aqueduct south of the SEZ. These species, which include the bullfrog, Colorado River toad, Rio Grande leopard frog, and Woodhouse's toad, would not be expected to occur within the SEZ. Thirty-one reptile species (the desert tortoise, which is a federally and state-listed species, 13 lizards, and 17 snakes) could occur within the SEZ. Direct impacts on amphibian and reptile species from SEZ development would be moderate (1.7 to 2.7% of potentially suitable habitats identified for the species in the SEZ region would be lost). With implementation of proposed design features, indirect impacts would be expected to be negligible.	Design features should be implemented to reduce the potential for direct effects on amphibians and reptiles that depend on specific habitat types that can be easily avoided (e.g., CRA, Homer Wash, and portions of Danby Lake).
Wildlife: Birds[b]	Nearly 100 species of birds have a range that encompasses the Iron Mountain SEZ region. However, potentially suitable habitats for about 40 of these species either do not occur on or are limited within the SEZ (e.g., habitat for waterfowl and wading birds). Direct impacts from habitat disturbance and long-term habitat reduction/fragmentation would be small to moderate (<0.01 to 7.5% of potentially suitable habitats identified for the species in the SEZ region would be lost). Other impacts on birds could result from collision with vehicles and facility structures, surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, noise, lighting, spread of invasive species, accidental spills, and harassment.	Pre-disturbance surveys should be conducted within the SEZ for bird species listed under the Migratory Bird Treaty Act. Impacts on potential nesting habitat of these species should be avoided, particularly during the nesting season. Pre-disturbance surveys should be conducted within the SEZ for the following desert bird focal species (CalPIF 2009): ash-throated flycatcher, black-tailed gnatcatcher, black-throated sparrow, burrowing owl, common raven, Costa's hummingbird, crissal thrasher, ladder-backed woodpecker, Le Conte's thrasher, phainopepla, and verdin. Impacts on potential nesting habitat of these species should be avoided.

TABLE 9.2.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Iron Mountain SEZ	SEZ-Specific Design Features
Wildlife: Birds[b] *(Cont.)*	Indirect impacts on areas outside the SEZ (e.g., impacts caused by dust generation, erosion, and sedimentation) are expected to be negligible with implementation of proposed design features.	Plant species that positively influence the presence and abundance of the desert bird focal species should be avoided to the extent practicable. These species include Goodding's willow, yucca, Joshua tree, mesquite, honey mesquite, screwbean, desert mistletoe, big saltbush, smoketree, and catclaw acacia. Take of golden eagles and other raptors should be avoided. Mitigation regarding the golden eagle should be developed in consultation with the USFWS and CDFG. A permit may be required under the Bald and Golden Eagle Protection Act. Minimize development in Danby Lake and preclude development on Homer Wash. This could reduce impacts on species such as the killdeer, least sandpiper, ash-throated flycatcher, black-tailed gnatcatcher, Costa's hummingbird, Le Conte's thrasher, and verdin.
Wildlife: Mammals[b]	Direct impacts on small game, furbearers, and small mammals on the SEZ from habitat disturbance and long-term habitat reduction/fragmentation would be moderate (1.7 to 3.0% of potentially suitable habitats identified for the species in the SEZ region would be lost). Other impacts on mammals could result from collision with vehicles and fences, surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, noise, lighting, spread of invasive species, accidental spills, and harassment.	Development in Homer Wash should be avoided in order to reduce impacts on species such as the round-tailed ground squirrel, white-tailed antelope squirrel, little pocket mouse, long-tailed pocket mouse, and any other mammal species that inhabit wash habitats.

TABLE 9.2.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Iron Mountain SEZ	SEZ-Specific Design Features
Wildlife: Mammals[b] *(Cont.)*	Indirect impacts on areas outside the SEZ (e.g., impacts caused by dust generation, erosion, and sedimentation) are expected to be negligible with implementation of proposed design features.	
Wildlife: Aquatic Biota[b]	No permanent water bodies, perennial streams, or wetlands are present within the boundaries of the Iron Mountain SEZ. A dry lake (Danby Lake) and ephemeral washes are present, but are not likely to contain aquatic habitat or communities. There is the potential for impacts on aquatic biota resulting from ground disturbance, contaminant inputs, and soil deposition from water and airborne pathways. Indirect effects on the CRA and wetlands near the SEZ may result from water withdrawal within the vicinity of the SEZ and from changes in water quality due to inputs of dust, sediment, and contaminants from the SEZ.	The amount of ground disturbance near Danby Lake should be minimized.
Special Status Species[b]	Potentially suitable habitat for 43 special status species occurs in the affected area of the Iron Mountain SEZ. For most of these special status species, between 1% and 6% of the potentially suitable habitat in the region occurs in the area of direct effects.	Pre-disturbance surveys should be conducted within the SEZ to determine the presence and abundance of special status species. Disturbance to occupied habitats for these species should be avoided or minimized to the extent practicable. If avoiding or minimizing impacts on occupied habitats is not possible for some species, translocation of individuals from areas of direct effects or compensatory mitigation of direct effects on occupied habitats could reduce impacts. A comprehensive mitigation strategy for special status species that used one or more of these options to offset the impacts of development should be developed in coordination with the appropriate federal and state agencies.

TABLE 9.2.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Iron Mountain SEZ	SEZ-Specific Design Features
Special Status Species[b] *(Cont.)*		Disturbance of desert riparian, wash, and playa habitats within the SEZ should be avoided or minimized to the extent practicable. In particular, development should be avoided within Danby Lake, which covers approximately 25,000 acres (100 km^2), and within Homer Wash. Avoiding or minimizing disturbance of these habitats could reduce impacts on four special status species. Avoiding or minimizing disturbance of sand dunes and sand transport systems, rocky cliffs, and outcrops on the SEZ could reduce impacts on 15 special status species. Consultations with the USFWS and the CDFG should be conducted to address the potential for impacts on the desert tortoise, a species listed as threatened under the ESA and CESA. Consultation would identify an appropriate survey protocol, avoidance measures, and, if appropriate, reasonable and prudent alternatives, reasonable and prudent measures, and terms and conditions for incidental take statements. Harassment or disturbance of special status species and their habitats in the affected area should be mitigated. This can be accomplished by identifying any additional sensitive areas and implementing necessary protection measures based upon consultation with the USFWS and CDFG.

TABLE 9.2.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Iron Mountain SEZ	SEZ-Specific Design Features
Air Quality and Climate	*Construction*: Temporary exceedances of AAQS for PM_{10} and $PM_{2.5}$ at the SEZ boundaries possible during construction; higher concentrations would be limited to the immediate area surrounding the SEZ boundary and would decrease quickly with distance. Modeling indicates that Class I PSD PM_{10} increments at the nearest federal Class I area (Joshua Tree NP) could be exceeded, but only under conservative assumptions (e.g., three simultaneous construction projects occurring in close proximity to the western SEZ boundary). In addition, construction emissions from the engine exhaust of heavy equipment and vehicles could cause some impacts on air-quality-related values (e.g., visibility and acid deposition) at the nearest federal Class I area, Joshua Tree NP. *Operations*: Positive impact due to avoided emission of air pollutants from combustion-related power generation: 16 to 28% of total SO_2, NO_x, Hg, and CO_2 emissions from electric power systems in the state of California avoided (up to 3,818 tons/yr SO_2, 6,271 tons/yr NO_x, 0.06 tons/yr Hg, and 14,836,000 tons/yr CO_2).	None.
Visual Resources	Large visual impacts on the SEZ and surrounding lands within the SEZ viewshed due to major modification of the character of the existing landscape; potential additional impacts from construction and operation of transmission lines and access roads within the transmission line and road viewsheds. The SEZ is located approximately 9.9 mi (15.9 km) northeast of Joshua Tree NP and Joshua Tree WA at the point of closest approach. Because of the short distance and elevated viewpoints, weak to moderate visual contrasts could be observed by NP or WA visitors near the point of closest approach. The SEZ is located within the CDCA. CDCA lands within the SEZ viewshed would be subject to visual impacts from solar development within the SEZ.	Within the SEZ, in areas visible from and within 1 mi (1.6 km) of the boundary of the Old Woman Mountains WA, visual impacts associated with solar energy project operation should be consistent with VRM Class II management objectives, as experienced from KOPs (to be determined by the BLM) within the WA; and in areas visible from between 1 and 3 mi (1.6 and 4.8 km) visual impacts should be consistent with VRM Class III management objectives. Within the SEZ, in areas visible from and south of State Highway 62, visual impacts associated with solar energy project operation should be consistent with VRM Class III management objectives, as

TABLE 9.2.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Iron Mountain SEZ	SEZ-Specific Design Features
Visual Resources *(Cont.)*	The SEZ is located approximately 6.6 mi (10.6 km) northwest of the Rice Valley WA at the point of closest approach. Moderate visual contrasts could be observed by WA visitors. The SEZ is located approximately 1.6 mi (2.6 km) north of the Palen-McCoy WA at the point of closest approach. Because of the short distance and elevated viewpoints, strong visual contrasts could be observed by WA visitors. The SEZ is adjacent to the Old Woman Mountains WA. Because of the short distance and elevated viewpoints, moderate to strong visual contrasts could be observed by WA visitors. The SEZ is adjacent to the Turtle Mountains WA, Turtle Mountains Scenic ACEC, and Turtle Mountains NNL. Because of the short distance and elevated viewpoints, moderate to strong visual contrasts could be observed by WA visitors. Portions of State Route 62 and Cadiz Road intersect the SEZ. Strong contrasts may be observed by travelers on these roads.	experienced from KOPs (to be determined by the BLM) within the Palen-McCoy WA. Within the SEZ, in areas visible from and within 3 mi (4.8 km) of the boundary of the Turtle Mountains WA, visual impacts associated with solar energy project operation should be consistent with VRM Class II management objectives, as experienced from KOPs (to be determined by the BLM) within the WA; and in areas visible from between 3 and 5 mi (4.8 and 8 km), visual impacts should be consistent with VRM Class III management objectives.
Acoustic Environment	*Construction*. Estimated noise levels at the nearest residences located near the west-central SEZ boundary (0.5 mi [0.8 km] from the SEZ boundary) would be about 50 dBA, which is higher than a typical daytime mean rural background level of 40 dBA but is below the San Bernardino County regulation of 55 dBA daytime L_{eq}. For 10-hour daytime work schedule, 47 dBA L_{dn} would be below the EPA guideline of 55 dBA for residential areas. *Operations*. Noise levels at the nearest residences from a parabolic trough or power tower facility would be about 45 dBA, which is higher than typical daytime mean rural background level of 40 dBA but well below	Noise levels from cooling systems equipped with TES should be managed so that levels at the nearest residences to the west of the west-central SEZ are kept within applicable guidelines. This could be accomplished in several ways, for example, through placing the power block approximately 1 to 2 mi (1.6 to 3 km) or more from residences, limiting operations to a few hours after sunset, and/or installing fan silencers.

TABLE 9.2.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Iron Mountain SEZ	SEZ-Specific Design Features
Acoustic Environment *(Cont.)*	the San Bernardino County regulation of 55 dBA daytime L_{eq}. For 12-hour daytime operation, the estimated 44 dBA L_{dn} falls well below the EPA guideline of 55 dBA for residential areas. However, in the case of 6-hour TES, the estimated nighttime noise level at the nearest residences would be 55 dBA, which is higher than the San Bernardino County regulation of 45 dBA nighttime L_{eq}. The day-night average noise level is estimated to be about 57 dBA L_{dn}, which is a little higher than the EPA guideline of 55 dBA L_{dn} for residential areas. If 80% of the SEZ were developed with dish engine facilities, the estimated noise level of 54 dBA at the nearest residences is higher than a typical daytime mean rural background level of 40 dBA but just below the San Bernardino County regulation of 55 dBA daytime L_{eq}. For 12-hour daytime operations, the estimated 51 dBA L_{dn} would be lower than the EPA guideline of 55 dBA L_{dn} for residential areas.	Dish engine facilities within the Iron Mountain SEZ should be located more than 1 to 2 mi (1.6 to 3 km) from the nearest residences, west of the west-central SEZ (i.e., the facilities should be located in other portions of the proposed SEZ). Direct noise control measures applied to individual dish engine systems could also be used to reduce noise impacts at the nearest residences.
Paleontological Resources	The potential for impacts on significant paleontological resources at the Iron Mountain SEZ in Ward Valley is largely unknown. A more detailed investigation of the local geological deposits of the SEZ and their potential depth is needed. The area around Danby Lake within the SEZ has a high potential to contain paleontological deposits and would require a paleontological survey.	The need for and the nature of any SEZ-specific design features would depend on findings of paleontological surveys.
Cultural Resources	Direct impacts on significant cultural resources could occur during site preparation and construction activities in the proposed SEZ; however, a cultural resource survey of the entire area of potential effect would first be required to identify archaeological sites, historic structures and features, and traditional cultural properties, and an evaluation would follow to determine whether any are eligible for listing in the NRHP. Ward Valley as a whole, and in particular the Danby Lake vicinity, was an important gathering area for salt and other natural resources; numerous	Avoidance of significant sites (historic properties) within the proposed Iron Mountain SEZ, specifically in the vicinity of Danby Lake and near the Iron Mountain Divisional Camp is recommended. Because of the possibility of burials in the vicinity of the proposed Iron Mountain SEZ and its location along the Salt Song Trail, it is recommended that for surveys conducted in the SEZ consideration be given

TABLE 9.2.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Iron Mountain SEZ	SEZ-Specific Design Features
Cultural Resources *(Cont.)*	prehistoric and Native American sites and trails are potentially located within the SEZ and could be impacted by solar energy development. Potential impacts on locations in the area that are of cultural or religious significance to Native American Tribes must also be evaluated. Activities associated with the WWII Desert Training Center were also prominent in the valley, and physical remnants of those activities are present within the SEZ and could be affected.	to include Native American representatives in the development of survey designs and historic property treatment and monitoring plans. Troops in training for World War II often used the same locations that Native Americans did for similar purposes. Any excavation of historic sites should take into consideration the potential for the co-location of prehistoric and ethnohistoric components. Other possible design features specific to the SEZ would be determined through consultation with the California SHPO and affected Tribes.
Native American Concerns	It is possible that there will be Native American concerns about the Salt Song Trail, which passes just west of the proposed Iron Mountain SEZ. Solar development within the SEZ is likely to be visible from the trail. Additional trail networks may also go through or near the SEZ. As consultations continue, it is possible that other Native American concerns regarding solar energy development within the SEZ will emerge.	The need for and nature of SEZ-specific design features regarding potential issues of concern, such as burials and the Salt Song Trail, would be determined during government-to-government consultation with the affected Tribes.
Socioeconomics	*Construction:* 1,221 to 16,165 total jobs; $73.2 million to $969 million income in ROI. *Operations:* 259 to 6,138 annual total jobs; $9.0 million to $230.3 million annual income in the ROI.	None.

TABLE 9.2.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Iron Mountain SEZ	SEZ-Specific Design Features
Environmental Justice	Minority and low-income *individuals* live within 50 mi (80 km) of the SEZ. However, as defined in CEQ guidelines, no low-income or minority *populations* occur within that area; thus, there would be no disproportionately high and adverse human health or environmental effects on low-income or minority populations.	None.
Transportation	The primary transportation impacts would result from commuting worker traffic. State Route 62 provides a regional traffic corridor that could experience moderate impacts for single projects that may have up to an additional 2,000 vehicle trips per day (maximum).	None.

Abbreviations: AAQS = ambient air quality standards; ACEC = Area of Critical Environmental Concern; BLM = Bureau of Land Management; BMP = best management practice; CDFG = California Department of Fish and Game; CEQ = Council on Environmental Quality; CESA= California Endangered Species Act; CO_2 = carbon dioxide; CRA = Colorado River Aqueduct; CSP = concentrating solar power; dBA = A-weighted decibel; DoD = U.S. Department of Defense; EPA = U.S. Environmental Protection Agency; ESA = Endangered Species Act; Hg = mercury; KOP = key observation point; KSLA = known sodium leasing area; L_{dn} = day-night average sound level; L_{eq} = equivalent continuous sound level; MTR = military training route; NNL = National Natural Landmark; NO_x = nitrogen oxides; NP = National Park; NRHP = *National Register of Historic Places*; $PM_{2.5}$ = particulate matter with an aerodynamic diameter of 2.5 μm or less; PM_{10} = particulate matter with an aerodynamic diameter of 10 μm or less; PSD = prevention of significant deterioration; PV = photovoltaic; ROI = region of influence; SEZ = solar energy zone; SHPO = State Historic Preservation Office; SO_2 = sulfur dioxide; TDS = total dissolved solids; TES = thermal energy storage; USFWS = U.S. Fish and Wildlife Service; VRM = visual resource management; WA = Wilderness Area; WWII = World War II.

[a] The detailed programmatic design features for each resource area to be required under BLM's Solar Energy Program are presented in Appendix A, Section A.2.2. These programmatic design features would be required for development in the proposed Iron Mountain SEZ.

[b] The scientific names of all plants, wildlife, aquatic biota, and special status species are provided in Sections 9.2.10 through 9.2.12.

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9.2.2 Lands and Realty

9.2.2.1 Affected Environment

The proposed Iron Mountain SEZ is located in a remote portion of the eastern Mojave Desert about 32 mi (51 km) west of Parker, Arizona, and 45 mi (72 km) southwest of Needles, California. The SEZ contains only BLM-administered lands, but there are about 2,560 acres (10.4 km^2) of private lands and about 640 acres (2.5 km^2) of state lands included within the external boundary of the SEZ. Another 560 acres (2.3 km^2) of state land is located adjacent to the southern boundary of the SEZ. On the western side of the SEZ is land owned by the Metropolitan Water District (MWD) that is surrounded on three sides by the SEZ. The MWD maintains a pumping station in this area that is part of the MWD Colorado River Aqueduct (CRA). The aqueduct essentially forms the southern and western boundaries of the SEZ. State Route 62 crosses through the very southern end of the SEZ, and the Cadiz Road, which is a good quality dirt/gravel road, crosses the area in a northwest–southeast direction. A railroad line and two underground natural gas pipelines parallel the Cadiz Road. A 230-kV power line that services the MWD pumping station passes north to south through the western portion of the SEZ.

As of March 2010, a total of seven solar development applications had been filed by four companies in the Iron Mountain SEZ. There are three active and two pending sodium leases in the northwestern portion of the SEZ in Danby Lake KSLA. There are additional ROWs for telephone and power lines and communication sites within the SEZ (BLM and USFS 2010b).

Most of the desert in and surrounding the SEZ was used for military training during World War II. Live fire exercises were conducted in many places and unexploded military ordnance can still be found in the area. Recently, limited surveys have been conducted to identify areas where military contamination might be present (DOI 2005; USACE 2007; USACE 1956).

The SEZ area is surrounded on three sides by desert mountain ranges designated as wilderness. Much of Joshua Tree National Park, which is about 10 mi (16 km) farther southwest from the SEZ than these three areas, is also designated as wilderness. The overall character of the area in and around the SEZ is rural and undeveloped. The SEZ and the areas surrounding it provide one of the very large and open viewscapes for which the California Desert Conservation Area (CDCA) is known.

9.2.2.2 Impacts

9.2.2.2.1 Construction and Operations

Development of the proposed Iron Mountain SEZ for utility-scale solar energy production would establish a very large industrial area that would exclude many existing and potential uses of the land, perhaps in perpetuity. Since the SEZ is largely undeveloped and rural, utility-scale solar energy development would be a new and discordant land use to the area. It also is possible that the 1,200 acres (5 km^2) of state land and about 2,400 acres (9.7 km^2) of private land located within or adjacent to the exterior boundaries of the SEZ could, with land owner concurrence, be developed in the same or a complementary manner as the public lands. Development of additional industrial or support activities also could be induced on additional private and state lands near the SEZ.

Existing ROW authorizations on the SEZ would not be affected by solar energy development since they are prior rights. Should the SEZ be designated, the BLM would still have discretion to authorize additional ROWs in the area until solar energy development was authorized, and then future ROWs would be subject to the rights granted for solar energy development. It is not anticipated that approval of solar energy development would have a significant impact on land available for ROWs in the area.

Cadiz Road is an important road that provides access through the SEZ and would likely remain open under any development scenario. Access to the east of the SEZ toward the Turtle Mountains could be obstructed by solar development. Access routes are already restricted in this direction since many crossings over the railroad have been removed; development of solar facilities could exacerbate this problem.

There is a potential hazard associated with unexploded military ordnance that could remain on the SEZ from past military training activities. This hazard would need to be addressed prior to ground-disturbing activities in any area of the SEZ, using results of available surveys as a starting point.

9.2.2.2.2 Transmission Facilities and Other Off-Site Infrastructure

An existing 230-kV transmission line runs north–south through the western portion of the SEZ; this line might be available to transport the power produced in this SEZ. Establishing a connection to the existing line would not involve the construction of a new transmission line outside of the SEZ so there would be no additional impact from a new line. At full build-out capacity of the proposed Iron Mountain SEZ, it is clear that substantial new transmission and or upgrades of existing transmission lines would be required to bring electricity from the SEZ to load centers; however, at this time the location and size of such new transmission facilities are unknown. Generic impacts of transmission and associated infrastructure construction and of line upgrades for various resources are discussed in Chapter 5. Project-specific analyses would need to identify the specific impacts of new transmission construction and line upgrades for any solar projects requiring additional transmission capacity.

Road access to the site is good and no new roads to the site would be required. Both internal electric transmission lines and roads would be required to support development of solar energy facilities. See Section 9.2.1.2 for the analysis assumptions for the SEZ.

9.2.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would provide adequate mitigation for some identified impacts. The exceptions would be impacts related to the exclusion of many existing and potential uses of the public land, perhaps in perpetuity; the visual impact of an industrialized-looking solar facility within an otherwise rural area; and any induced changes in land use on private and state lands.

The following is a proposed design feature specific to the proposed Iron Mountain SEZ:

- Survey of solar energy development sites for possible unexploded military ordnance would be required.

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9.2.3 Specially Designated Areas and Lands with Wilderness Characteristics

9.2.3.1 Affected Environment

The proposed Iron Mountain SEZ is located in the CDCA and also in the center of an area of high wilderness and scenic value. Within 25 mi (40 km) of the area, 11 wilderness areas, including 1 within Joshua Tree National Park, are visible from the SEZ. The Turtle Mountain ACEC, which was designated for its outstanding scenic resources, is included within the boundary of the Turtle Mountains Wilderness. Additionally, the Chemehuevi Desert Wildlife Management Area (DWMA) and the Patton Iron Mountain Divisional Camp ACEC abut the SEZ. The Chemehuevi DWMA also overlaps the Turtle Mountains Wilderness to a great extent. Figure 9.2.3.1-1 shows the relationship of these areas to the SEZ. No lands with wilderness characteristics outside of designated wilderness areas have been identified within 25 mi (40 km) of the SEZ.

As part of the planning process for the BLM-administered lands in the CDCA, all public lands, except for about 300,000 acres (1,214 km^2) of scattered parcels, were designated geographically into one of four multiple-use classes. The classification was based on the sensitivity of resources and the kinds of uses for each geographic area. Four multiple use classes were used (BLM 1999):

- Class C is for lands designated either as wilderness or for wilderness study areas. These lands are managed to protect their wilderness characteristics.

- Class L (Limited Use) protects sensitive, natural, scenic, ecological, and cultural resource values. Public lands designated as Class L are managed to provide for generally lower intensity, carefully controlled multiple use of resources, while ensuring that sensitive values are not significantly diminished.

- Class M (Moderate Use) is based upon a controlled balance between higher intensity use and protection of public lands. This class provides for a wide variety of present and future uses such as mining, livestock grazing, recreation, energy, and utility development. Class M management is also designed to conserve desert resources and to mitigate damage to those resources which permitted uses may cause.

- Class I (Intensive use). Its purpose is to provide for the concentrated use of lands and resources to meet human needs. Reasonable protection will be provided for sensitive natural and cultural values. Mitigation of impacts on resources and rehabilitation of affected areas will occur insofar as possible.

Land within the SEZ is predominantly Class M (93%) with some Class I (6%) and Class L (1%). The Multiple Use Class Guidelines contained in the CDCA Plan indicate that wind, solar, or geothermal electrical generation facilities could be allowed in all these classes.

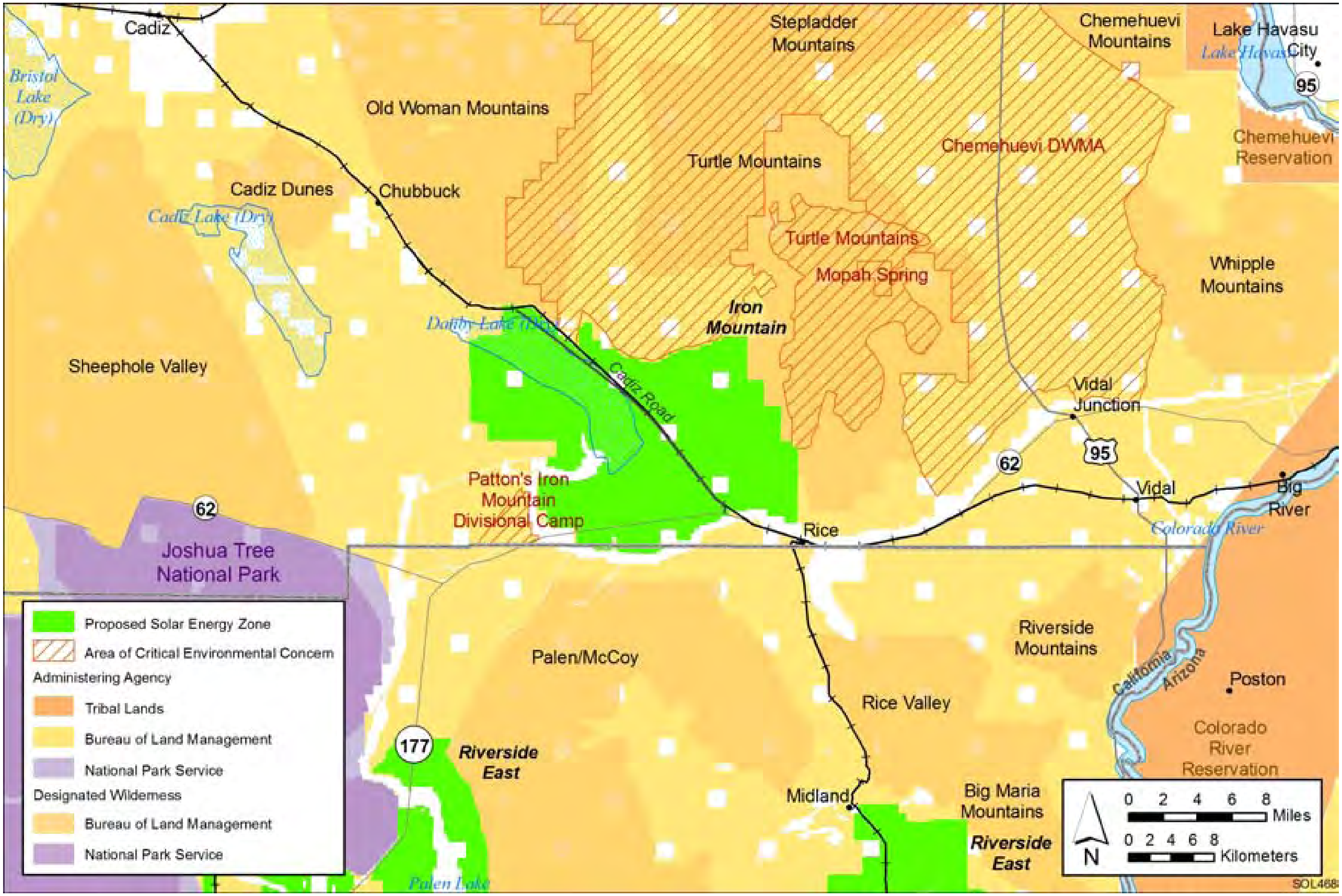

FIGURE 9.2.3.1-1 Specially Designated Areas in the Vicinity of the Proposed Iron Mountain SEZ

9.2.3.2 Impacts

9.2.3.2.1 Construction and Operations

The potential impact on specially designated areas from solar development within the proposed Iron Mountain SEZ is difficult to determine and would vary by solar technology employed, the specific area being affected, and the perception of individuals viewing the development. Development of the SEZ, especially full development, would be a dominating factor in the viewshed from large portions of some of these specially designated areas, as summarized in Table 9.2.3.2-1.

The data provided in Table 9.2.3.2-1 assume the use of the power tower solar energy technology, which because of the potential height of these facilities, could be visible from the largest amount of land of the technologies being considered in the PEIS. The potential visual impacts of solar energy projects in terms of the amount of acreage within specially designated areas within the viewshed of the SEZ could be less for shorter solar energy facilities; however, assessment of the visual impacts of solar development on specially designated areas must be conducted on a site-specific and technology-specific basis to accurately identify impacts. See Section 9.2.14 for a more complete review of the visual impacts for the Iron Mountain SEZ.

In general, the closer a viewer is to solar development, the greater the impact on an individual's perception (see Section 9.2.14 for a more thorough discussion of visual impacts and analysis). The viewing height above a solar energy development area, the size of the solar development area, and the purpose for which a person is visiting an area are also important. Individuals seeking a wilderness experience within these areas could be expected to be more adversely affected than those simply traveling along the highway with another destination in mind. In the case of the Iron Mountain SEZ, the low-lying location of the SEZ in relation to surrounding specially designated areas would tend to highlight the industrial-like development in the SEZ. In addition, because of the generally undeveloped nature of the whole area in and around the SEZ, impacts on wilderness characteristics may be more significant than in other, less pristine areas.

The occurrence of glint and glare at solar facilities could potentially cause large though temporary increases in brightness and visibility of the facilities. The visual contrast levels that were assumed to assess potential impacts on specially designated areas do not account for potential glint and glare effects; however, these effects would be incorporated into a future site- and project-specific assessment that would be conducted for specific proposed utility-scale solar energy projects.

The NPS has identified concerns about the potential impact of solar energy development on natural, cultural, and historical resources inside and outside of the boundaries of Joshua Tree National Park. In addition, because of the lack of development in the immediate region of the SEZ, the night sky is very dark and the NPS also has identified concerns that solar facility development in the SEZ and in areas adjacent to the park could adversely affect the quality of the night sky environment as viewed from the park. The amount of light that may emanate from Iron

TABLE 9.2.3.2-1 Specially Designated Areas Potentially within the Viewshed of Solar Facilities within the Proposed Iron Mountain SEZ[a]

Resource	Total Acres	Acres within 5-mi[b] (8-km) Viewshed		Acres within 15-mi (24-km) Viewshed		Acres within 25-mi (40-km) Viewshed	
		No. of Acres	Percentage of Total Acres	No. of Acres	Percentage of Total Acres	No. of Acres	Percentage of Total Acres
California Desert Conservation Area	25,919,319	308,931	1.2	627,189	2.4	821,521	3.2
Turtle Mountains ACEC	50,057	9,384	18.7	10,024	20.0	10,024	20.0
Joshua Tree NP	793,331			8,931	1.1	14,606	1.8
Wilderness Areas							
Big Maria Mountains	46,056					8,974	19.5
Cadiz Dunes	21,286			79	0.4	1,443	6.8
Joshua Tree NP	586,623			8,898	1.5	14,333	2.4
Old Woman Mountains	183,555	20,092	10.9	74,026	40.3	88,760	48.4
Palen-McCoy	224,414	19,297	8.6	57,313	25.5	60,341	26.9
Rice Valley	43,412			34,944	80.5	40,639	93.6
Riverside Mountains	24,206			688	2.8	818	3.4
Sheephole Valley	195,002			11,755	6.0	37,033	19.0
Stepladder Mountains	84,187					12,833	15.2
Turtle Mountains	182,610	26,358	14.4	70,305	38.5	73,092	40.0
Whipple Mountains	78,484					97	0.1

[a] Identified assuming a power tower facility of 650 ft (198.1 m).

[b] To convert acres to km^2, multiply by 0.004047; to convert mi to km, multiply by 1.609.

Mountain solar facilities is not known but it could affect the national park and the surrounding wilderness areas.

The following are descriptions of the potential impacts of solar energy facilities on specially designated areas:

Designated Wilderness within 5 mi (8 km) of the SEZ

- The Turtle Mountains WA abuts the boundary of the SEZ for about 11 mi (17.7 km). The Old Woman Mountains Wilderness is separated from the SEZ by about 0.25 mi (0.40 km), where the railroad and Cadiz Road skirt the northern end of the SEZ. The southern boundary of the SEZ ranges from 2 to 3.5 mi (3.2 to 5.6 km) from the Palen-McCoy Wilderness. Within 5 mi (8 km) of the SEZ, wilderness characteristics would be adversely affected by development within the SEZ. Designated wilderness within the 5-mi (8-km) viewshed of the SEZ includes about 66,000 acres (267 km^2). See Table 9.2.3.2-1 for additional details about the designated wilderness affected by this SEZ.

Designated Wilderness within 15 mi (24 km) of the SEZ

- The boundary of the Rice Valley WA is within 7 mi (11 km) of the SEZ, and 80% of the WA is located in the zone between 5 and 15 mi (9.7 and 24 km) from the SEZ. Because of the distance from the SEZ and because of the possible impact of the intervening development associated with the MWD aqueduct and State Route 62, the impacts on wilderness characteristics in the Rice Valley WA would be expected to be less in this distance zone than those described for the three areas listed above. The reduction of impacts because of increased distance from the SEZ may not be true for the additional acreage in this distance zone in the Turtle Mountains, Old Woman Mountains, and Palen-McCoy WAs because of the potential large expanse of solar development in the SEZ that would be visible. It is anticipated that the wilderness characteristics for these three areas would be adversely affected at distances greater than 5 mi (8 km). As shown in Table 9.2.3.2-1, about 237,000 acres (959 km^2) of these four WAs is within the 15-mi (24-km) viewshed of the SEZ. In addition, at this distance, small portions of four more WAs begin to be included in the viewshed of the Iron Mountain SEZ, including the WA within Joshua Tree NP.

Designated Wilderness within 25 mi (40 km) of the SEZ

- Between 15 and 25 mi (24 and 40 km), the impact of solar development in the Iron Mountain SEZ on wilderness characteristics is expected to be considerably reduced, as development in the SEZ becomes less of a factor in the viewshed. However, as shown in Table 9.2.3.2-1, significant percentages of the Turtle Mountains, Old Woman Mountains, Palen-McCoy, and Rice Valley WAs are included in the viewshed of the SEZ within this distance. The cumulative impact on wilderness characteristics in these four areas would be expected to be more significant because of the large continuous extent of solar development that would be visible from these WAs even at this distance.

Three other areas—Big Maria Mountains, Sheephole Valley, and Stepladder Mountains WAs—also have significant percentages of designated wilderness in the viewshed of the SEZ at this distance, but the impact on these areas from development in the Iron Mountain SEZ is expected to be minor because of the longer distance and the fact there would be little or no intervening views of solar development in the SEZ. It is anticipated that wilderness characteristics in areas within Joshua Tree National Park with views of the SEZ would be affected in the same manner as these three WAs. At this distance, about 338,000 acres (1,368 km^2) of designated wilderness is included in the viewshed of the Iron Mountain SEZ.

Joshua Tree National Park

- The closest boundary of the national park and designated wilderness within the park is located about 10 mi (16 km) from the boundary of the SEZ. Visitors in about 14,606 acres (59 km^2), or 1.8% of the park, would have visibility of solar development within the SEZ. Almost all of this area within the park with visibility of the SEZ is designated wilderness. The NPS has commented that solar energy development on public lands within and outside the study area adjacent to the park have a high potential to adversely affect resources in the Coxcomb Mountains in the northern and eastern portions of the park. Based on visual analysis of the potential impacts of development of the SEZ and largely because of the distance to the park, it is anticipated that solar development would have a minimal impact on the park.

  The eastern portion of the national park affords park visitors with an unimpeded opportunity for night sky viewing. Maintaining the high quality of night sky viewing opportunity in this portion of the park is a major concern for the NPS. The concerns of the NPS relate to any artificially induced light from nighttime maintenance activity and/or security lighting within 20 mi (32 km) of the park's boundaries. At this time no estimate of the potential for impact on night sky viewing can be provided.

ACECs

- The Turtle Mountains ACEC, which was designated for its outstanding scenic resources, is located to the east of the SEZ within the boundaries of the Turtle Mountains Wilderness. The boundary of the scenic ACEC abuts the SEZ in one area, and about 19% of the ACEC is within 5 mi (8 km) and in full view of the SEZ. Although the ACEC would not be directly affected by development in the SEZ, the setting of the area would be adversely affected, and it is likely that visitors to the ACEC would find the scenic resources of the area within view of the SEZ to be adversely affected by the presence of solar facilities.

- The Patton Iron Mountain Divisional Camp ACEC is located near the southwest corner of the SEZ. The area is significant because Patton's Third Army trained there prior to deployment during WWII. The ACEC relates to the cantonment area only, not the entire divisional camp, which includes its related firing ranges. The area would not be directly affected by development of the SEZ, but it is possible that if additional human traffic is drawn to the area because of the solar facilities, increased management efforts may be needed to protect the site.

- The Chemehuevi DWMA is an 875,000-acre (3,540-km^2) area established to provide for the management and protection of the desert tortoise. The DWMA abuts the northern boundary of the SEZ and straddles both the 230-kV transmission line and the main dirt road providing access to the SEZ from the north. Increased traffic on this road accessing the SEZ and an increasing number of people in the area could increase the mortality of the desert tortoise. Since the area is very large, however, it is not anticipated that there would be a significant effect on the function of the DWMA or on the tortoise population.

California Desert Conservation Area

- The viewshed within 25 mi (40 km) of the Iron Mountain SEZ includes about 822,000 acres (3,327 km^2), or about 3.2% of the CDCA (Table 9.2.3.2-1), and the viewshed may extend to 40 mi (64 km). Installation of renewable energy facilities is consistent with the CDCA Plan, but full development of the SEZ would adversely affect wilderness characteristics in three designated WAs, scenic values in one ACEC, and opportunities for undeveloped recreation in and around the SEZ, and would cause a small loss of recreational use within the area of the SEZ. It is anticipated that full development of the SEZ would adversely affect recreational use in about 66,000 acres (267 km^2) of wilderness areas surrounding the SEZ that is located within the most sensitive 5-mi (8-km) visual zone surrounding the proposed SEZ. Overall adverse impacts on the CDCA appear to be significant.

9.2.3.2.2 Transmission Facilities and Other Off-Site Infrastructure

See Section 9.2.2.2.2 for the discussion of the assumptions and requirements regarding construction of new transmission lines or roads; the discussion also applies to impacts on specially designated areas.

9.2.3.3 SEZ-Specific Design Features and Design Feature Effectiveness

Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would provide some level of mitigation for identified impacts. The exceptions would be that SEZ development would adversely affect wilderness characteristics in the Turtle Mountains, Old Woman Mountains, and Palen-McCoy WAs and scenic resources in the Turtle Mountain ACEC.

Proposed design features specific to the proposed SEZ include the following:

- The application of SEZ-specific design features for visual resource impacts presented in Section 9.2.14 may reduce the visual impacts on wilderness characteristics, scenic resources, and on night sky viewing opportunities.

It is anticipated that even with the adoption of the design features, adverse impacts on wilderness characteristics and scenic resources would not be completely mitigated and residual impacts would remain.

9.2.4 Rangeland Resources

Rangelands resources include livestock grazing and wild horses and burros, both of which are managed by the BLM. These resources and possible impacts on them from solar development within the proposed Iron Mountain SEZ are discussed in Sections 9.2.4.1 and 9.2.4.2.

9.2.4.1 Livestock Grazing

9.2.4.1.1 Affected Environment

The SEZ is not included within a grazing allotment, and grazing is not authorized in the area. There is one allotment located just to the south of the area.

9.2.4.1.2 Impacts

There would be no impact on livestock grazing.

9.2.4.1.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features would be necessary to protect or minimize impacts on livestock grazing.

9.2.4.2 Wild Horses and Burros

9.2.4.2.1 Affected Environment

Section 4.4.2 discusses wild horses (*Equus caballus*) and burros (*E. asinus*) that occur within the six-state study area. Twenty-two wild horse and burro HMAs occur within California. Also, several HMAs in Arizona are located near the Arizona–California border. Three of these HMAs occur within a 50-mi (80-km) radius of the proposed Iron Mountain SEZ (Figure 9.2.4.2.1-1). The closest HMA is the Chemehuevi HMA located in California, which contains only wild burros and is about 20 mi (32 km) east-northeast of the SEZ. The Chemehuevi HMA contains an estimated population of 201 burros (BLM 2009e).

In addition to the HMAs managed by the BLM, the USFS has 51 established wild horse and burro territories in Arizona, California, Nevada, New Mexico, and Utah and is the lead management agency that administers 37 of the territories (Giffen 2009; USFS 2007). The closest territory to the proposed Iron Mountain SEZ is the Big Bear Territory within the San Bernardino

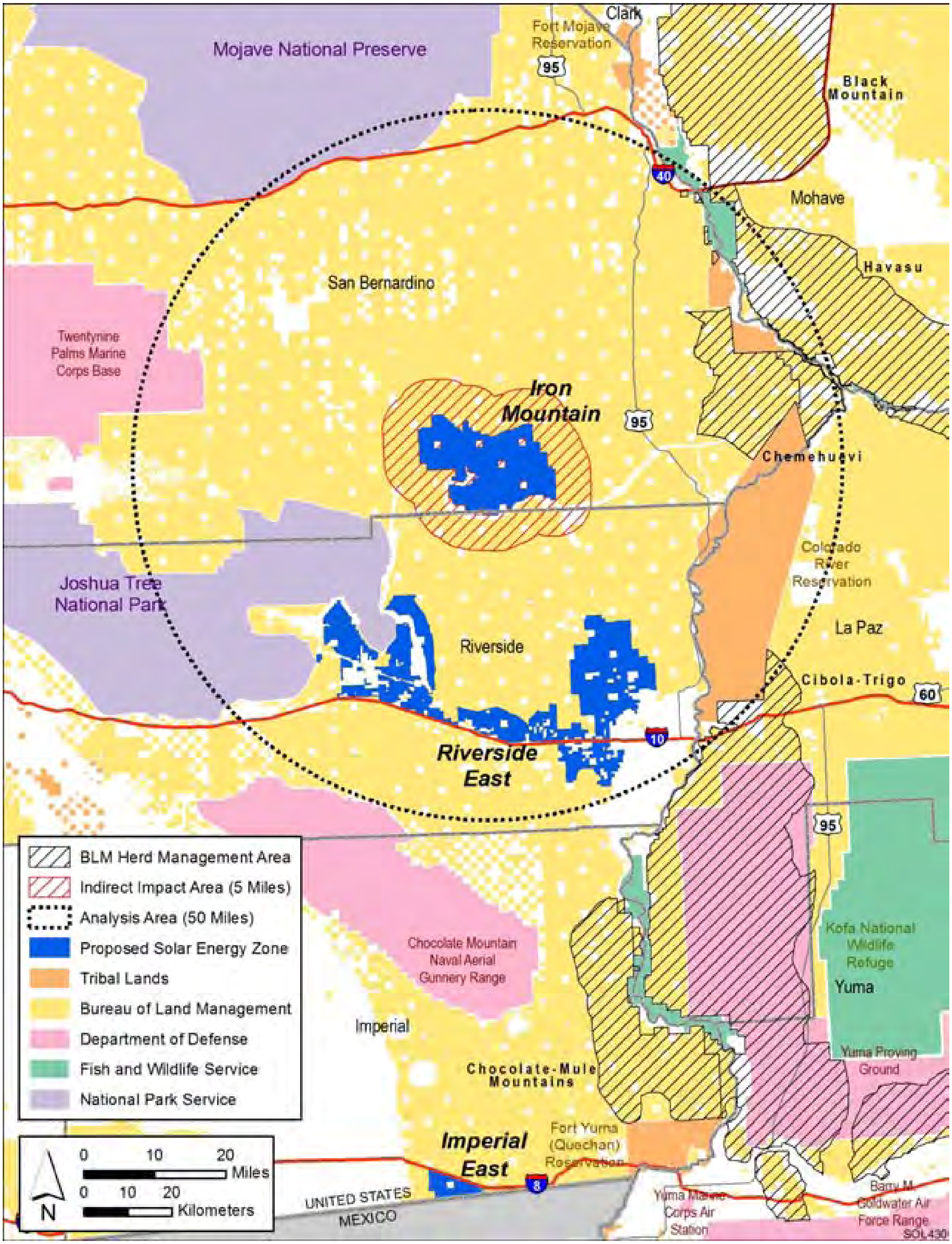

FIGURE 9.2.4.2-1 Wild Horse and Burro Herd Management Areas within the SEZ Region for the Proposed Iron Mountain SEZ (Sources: BLM 2009d; USFS 2007)

National Forest. It is located more than 80 mi (129 km) west of the SEZ. This territory is managed for a population of 60 wild burros (USFS 2007).

9.2.4.2.2 Impacts

Because the proposed Iron Mountain SEZ is 21 mi (34 km) or more from any wild horse and burro HMA managed by the BLM and more than 80 mi (129 km) from any wild horse and burro territory administered by the USFS, solar energy development within the SEZ would not affect wild horses and burros that are managed by these agencies.

9.2.4.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A, Section A.2.2, would reduce the potential for effects on wild horses and burros. No proposed Iron Mountain SEZ-specific design features would be necessary to protect or minimize impacts on wild burros.

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9.2.5 Recreation

9.2.5.1 Affected Environment

The proposed Iron Mountain SEZ is flat, and the land is of a type and quality that generally does not attract large numbers of recreational users. Although the area is remote, access into the area is easy, and primarily during the cooler months, low levels of recreational use are likely to occur. The CDCA, like many remote areas of the public lands, attracts individuals and families seeking undeveloped recreation opportunities. Opportunities for exploration of old townsites, mining operations, and old roads as well as for hunting and backcountry camping, hiking, and wildlife and wildflower viewing are important attractions throughout the CDCA. There are areas both in and adjacent to the Iron Mountain SEZ that provide these kinds of attractions.

The SEZ is very large and is part of a large open vista that is still undeveloped. The area was used for military training during WWII, and several of the old military encampment sites outside the SEZ attract visitors interested in the history of that period. Portions of the area are important as access points to the Turtle Mountains WA. Cadiz Road, which passes through the SEZ, is a major access route to backcountry recreation areas outside of the SEZ. In 2004, the area was designated in the Northern and Eastern Mohave Route Designation Amendment to the California Desert Plan as “Limited, Designated Roads and Trails” (BLM 2009b). Subsequently, several road/trail segments in the SEZ have been designated as open to vehicular use.

State Route 62, which passes through the southern end of the SEZ, is a major travel route between the Los Angeles metropolitan area and the Colorado River recreation areas. There are approximately 10 segments of OHV routes designated as open within the proposed Iron Mountain SEZ; these are shown in Figure 9.2.21-1.

9.2.5.2 Impacts

9.2.5.2.1 Construction and Operations

Recreational users would be excluded from developed areas of the SEZ. Although there are no recreation statistics for the SEZ and surrounding lands, it is anticipated that there would be a small loss of recreation use caused by development of the Iron Mountain SEZ. Because of the visual impact of a large and highly visible industrial-type development in the SEZ, opportunities for an undeveloped and primitive recreation experience in and around the SEZ would be lost or reduced. Access through areas developed for solar power production could be closed or rerouted. Access to public lands to the east of the SEZ could be adversely affected by solar energy development if provision is not made to maintain public road access around or through any solar development areas.

Open OHV routes crossing areas granted ROWs for solar facilities would be redesignated as closed. However, a programmatic design feature addressing recreational impacts would require consideration of development of alternative routes that would retain a similar level of access across and to public lands as a part of the project proposal (see Section 5.5.1 for more details on how routes coinciding with proposed solar facilities would be treated).

Based on viewshed analysis (see Section 9.2.14), the Iron Mountain SEZ would be visible from a wide area, perhaps as far away as I-40, about 40 mi (64 km) to the northwest. Solar facilities in the SEZ and in adjacent areas currently under solar application would cause the loss of the currently expansive and undeveloped viewshed over a large area. The viewshed within 25 mi (40 km) of the Iron Mountain SEZ alone includes about 822,000 acres (3,327 km^2) within the CDCA (Table 9.2.3.2-1). The viewshed analysis also shows that the SEZ would be visible from large portions of the surrounding wilderness areas. About 66,000 acres (267 km^2) of designated wilderness in the Turtle Mountains, Old Woman Mountains, and Palen-McCoy WAs is located within the most sensitive 5-mi (8-km) visual zone surrounding the proposed SEZ, and wilderness recreation use in this area would likely be adversely affected by solar development in the SEZ. Because of the continuity of the view of solar development beyond 5 mi (8 km) from these three WAs, the adverse impacts on wilderness recreation use may extend further than 5 mi (8 km) into these areas.

9.2.5.2.2 Transmission Facilities and Other Off-Site Infrastructure

See Section 9.2.2.2.2 for the discussion of the assumptions and requirements regarding construction of new transmission lines or roads that also applies to impacts on recreation use.

9.2.5.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features were identified for addressing impacts on recreation use at the proposed Iron Mountain SEZ. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM’s Solar Energy Program, would provide limited mitigation for some identified impacts. The exceptions would be the loss of recreation use within the SEZ and of opportunities for undeveloped and primitive recreation around the SEZ. Wilderness recreation use in the Turtle Mountains, Old Woman Mountains, and Palen-McCoy WAs would also be adversely affected.

9.2.6 Military and Civilian Aviation

9.2.6.1 Affected Environment

The proposed Iron Mountain SEZ is located under five MTRs, which include a mixture of visual and instrument routes; the lowest floor elevation is 200 ft (61 m) AGL. Because of this, the area is identified by the BLM as an area where advance consultation with the DoD is required for approval of activities that could adversely affect the use of the MTRs. The military has indicated that development of portions of this area are compatible with its existing use regardless of the proposed heights of solar facilities, while other portions should have height limits and some areas may be incompatible with existing military use.

There are no civilian aviation facilities in the vicinity of the SEZ that would be affected by construction and operation of solar energy facilities.

9.2.6.2 Impacts

The development of any solar energy or transmission facilities that encroach into the airspace of the MTR could interfere with military training activities. While the military has indicated that solar development on portions of the Iron Mountain SEZ is compatible with existing military use, it has also commented that other portions should have height limits for facilities, and some areas may be incompatible with existing military use.

The system of military airspace in the Southwest overlaps much of the area of highest interest for solar development, and there is potential for solar development to result in cumulative effects on the system of MTRs that stretch beyond just one SEZ or solar project.

There would be no impact on civilian aviation.

9.2.6.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features were identified for addressing impacts on military and civilian aviation at the proposed Iron Mountain SEZ. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would provide adequate mitigation for identified impacts.

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9.2.7 Geologic Setting and Soil Resources

9.2.7.1 Affected Environment

9.2.7.1.1 Geologic Setting

Regional Geology

The proposed Iron Mountain SEZ lies within the eastern Mojave Desert region of the Basin and Range physiographic province in southeastern California. The site is at the southern end of Ward Valley, a 53-mi (85-km) long north-trending intermontane basin that is bounded on the west by the Piute, Little Piute, and Old Woman Mountains and on the east by the Sacramento, Stepladder, and Turtle Mountains (National Research Council 1995; Figure 9.2.7.1-1). Ward Valley is one of many internally drained, structural basins typical of the Basin and Range province.

Basin-fill in Ward Valley consists of alluvium, fan deposits, and playa deposits estimated to be as thick as 1,970 ft (600 m). These deposits are generally thickest in the center of the basin, thin out toward the edges, and become more consolidated with depth. The principal water-bearing units in the region are in these deposits. The relative volumes of younger basin-fill and alluvium (Quaternary) and older basin-fill (Miocene and Pliocene) are not known. Ward Valley basin-fill deposits are thought to rest uncomfortably on highly faulted Miocene sedimentary and volcanic rocks that dip to the west (CDWR 2003; National Research Council 1995).

Exposed sediments in Ward Valley are predominantly modern alluvial and playa deposits (Figure 9.2.7.1-2). Dune sands are common, extending from Rice Valley across the southwestern corner of the Iron Mountain SEZ and continuing along the chain of dry lakes (Danby, Cadiz, Bristol) to the northwest.

The surface of Danby Lake is mainly “efflorescent ground,” a white, powdery surface caused by the evaporation of capillary brine; areas of the lakebed on the north and south ends, however, are covered by a salt crystal surface and claypan (smooth, hard, compact clay). Gypsum-capped pedestals within the lake are remnants of a once higher lakebed surface that has since been reduced by deflation and erosion. Two lithologic cores drilled in Danby Lake in the late 1950s found the upper 120 to 130 ft (37 to 40 m) in both cores to be a yellowish-brown silty clay, grading with depth into an olive gray clay with coarse sand grains. Thick sequences of crystalline gypsum occurred in both cores at depths of about 300 ft (91 m)—one thicker than 200 ft (61 m)—but no salt beds were found in either core (although commercial salt deposits are known to exist in these areas). The lack of correlation between core sediments with increasing depth suggests that they were deposited irregularly as a result of intermittent flooding events and not within a perennial lake environment (Bassett et al. 1959).

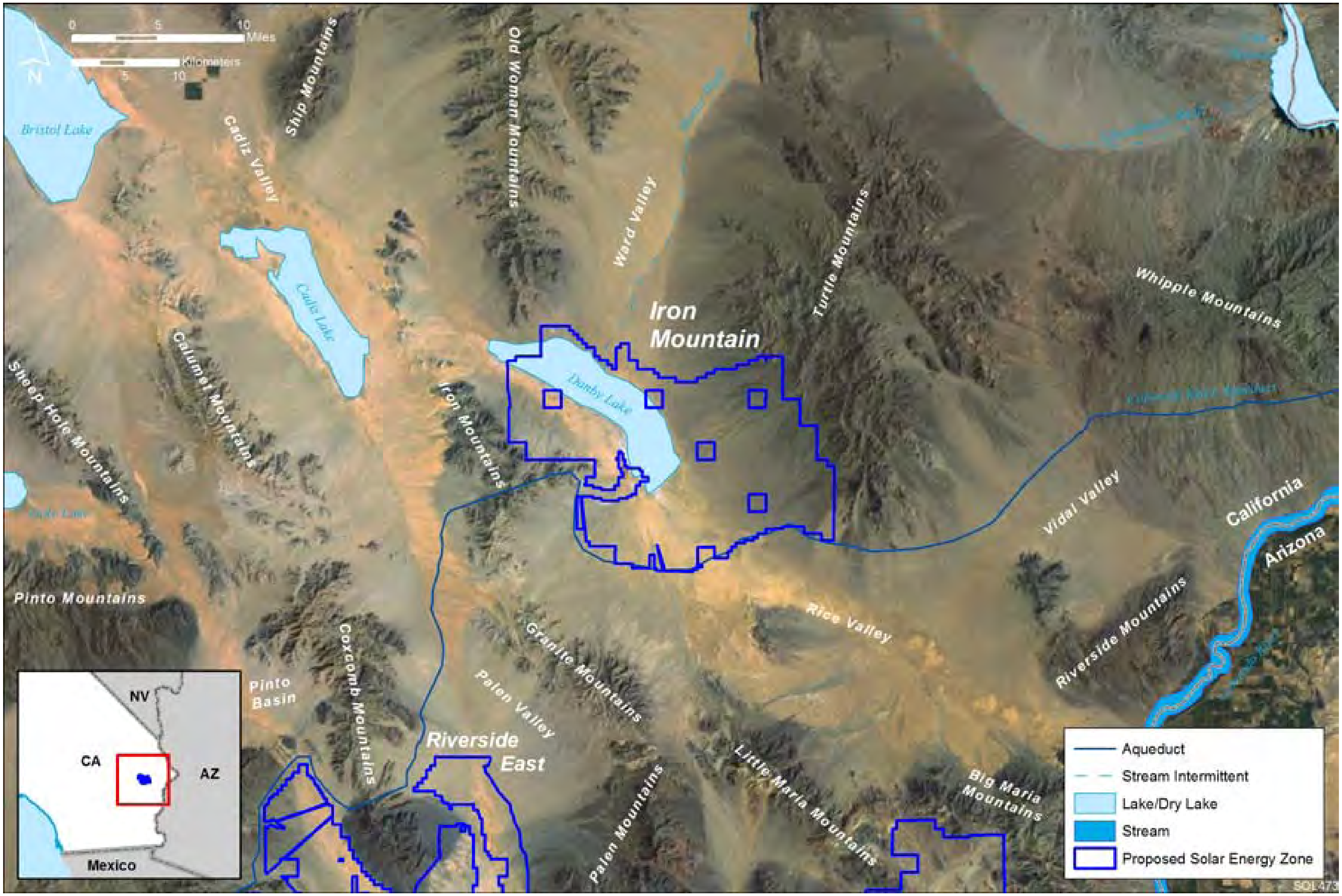

FIGURE 9.2.7.1-1 Physiographic Features in the Ward Valley Region

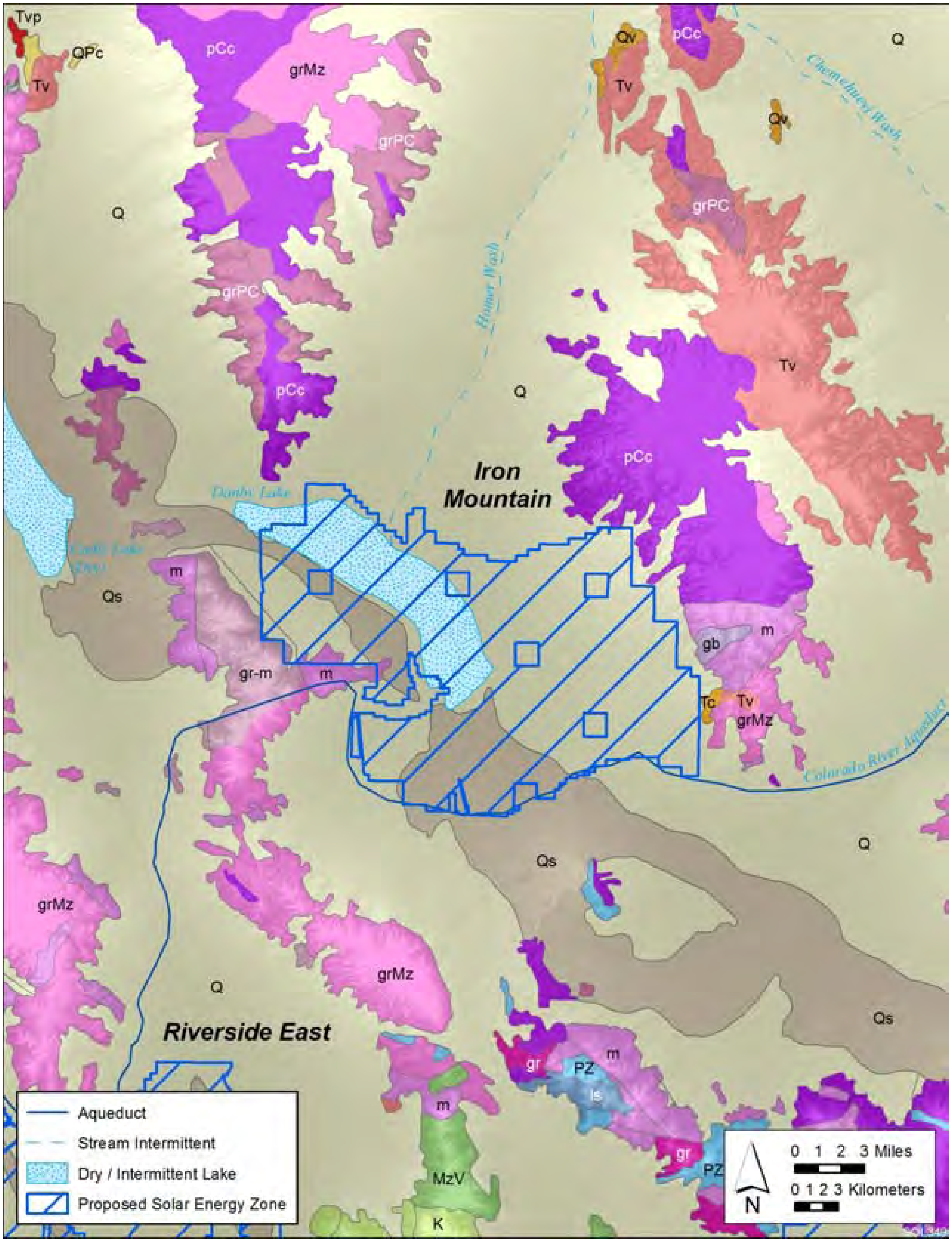

FIGURE 9.2.7.1-2 Geologic Map of the Ward Valley Region (adapted from Ludington et al. 2007 and Gutierrez et al. 2010)

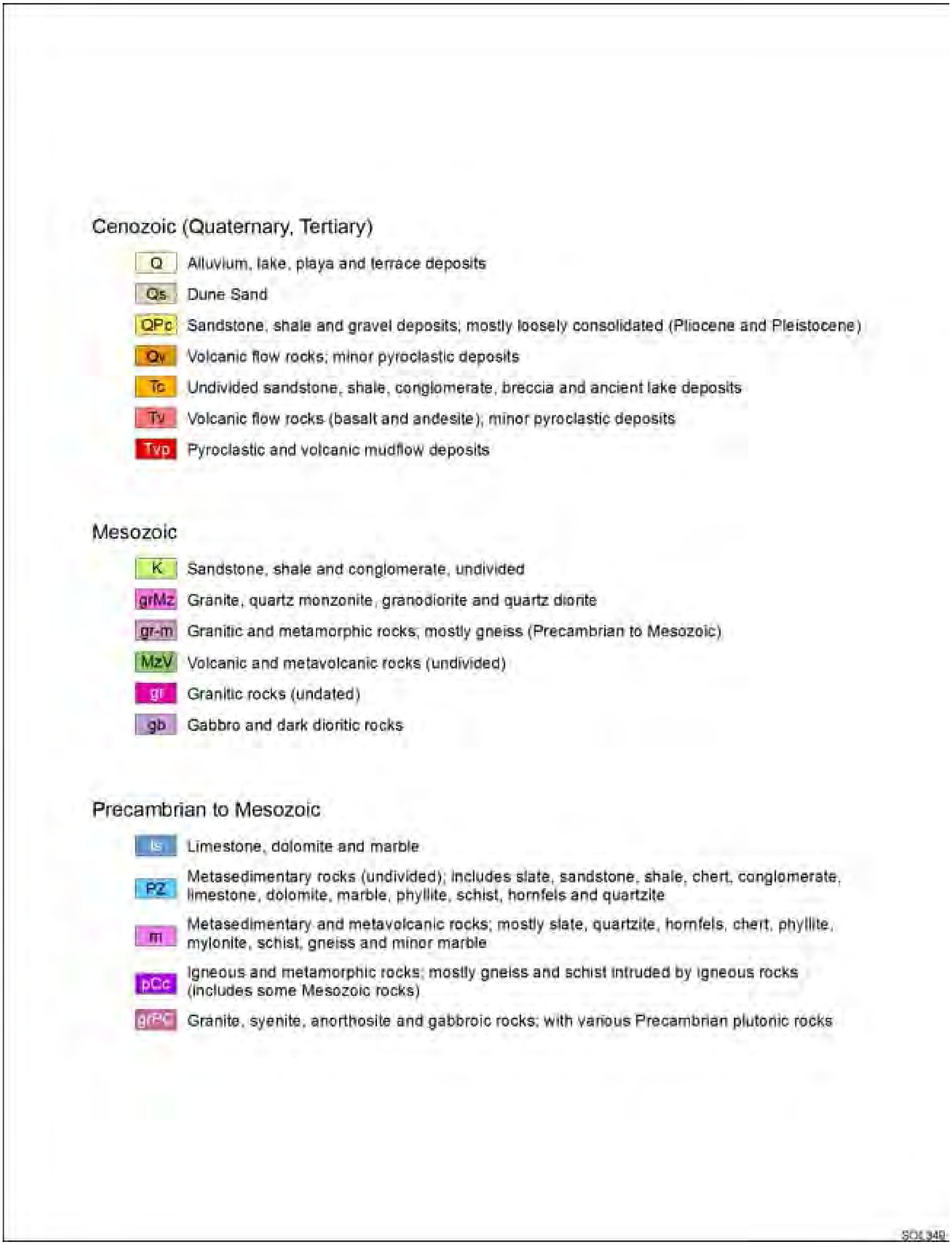

FIGURE 9.2.7.1-2 (Cont.)

Topography

Elevations along the axis of Ward Valley range from about 2,130 ft (650 m) near the north end and along the valley sides to about 610 ft (186 m) at the southern end of the valley within Danby Lake. Gently sloping alluvial fan deposits occur along the mountain fronts and coalesce toward the basin center forming a broad, low-relief terrain (bajada). The valley is drained by Homer Wash, an ephemeral stream that flows to the south and discharges into Danby Lake. Waters discharging to Danby Lake drain toward a sump near the southwest edge of the lakebed. Danby Lake is generally dry except for brief periods following heavy rain events (National Research Council 1995; Moyle 1967). The dry lake is bordered to the southwest by active dunes, part of a series of dunes that extend from the Bristol Lake area southeastward into Rice Valley (Figure 9.2.7.1-1).

The proposed Iron Mountain SEZ is located between the Iron Mountains (to the west) and the Turtle Mountains (to the east) in the southern part of Ward Valley, about 20 mi (32 km) northwest of the Colorado River. Elevations range from about 1,772 ft (540 m) in the foothills of the Turtle Mountains just within the northeastern corner of the SEZ to less than 656 ft (200 m) within the dry lakebed (Figure 9.2.7.1-3).

Geologic Hazards

The types of geologic hazards that could potentially affect solar project sites and their mitigation are discussed in Sections 5.7.3 and 5.7.4. The following sections provide a preliminary assessment of these hazards at the proposed Iron Mountain SEZ. Solar project developers may need to conduct a geotechnical investigation to assess geologic hazards locally to better identify facility design criteria and site-specific mitigation measures to minimize their risk.

Seismicity. The proposed Iron Mountain SEZ is located at the eastern margin of the Eastern California Shear Zone and to the northeast of the San Andreas Fault Zone—both seismically active regions dominated by northwest-trending right-lateral strike slip faulting and categorized as "potentially active" (i.e., having surface displacement within the last 11,000 years [Holocene]) under the Alquist-Priolo Earthquake Fault Zoning Act (Figure 9.2.7.1-4). The term "potentially active" generally denotes that a fault has shown evidence of surface displacement during Quaternary time (the last 1.6 million years). However, because there are numerous such faults in California, the State Geologist has introduced new, more discriminating criteria for zoning faults under the Alquist-Priolo Act. Currently, zoned faults include those that are "sufficiently active," that is, showing evidence of surface displacement within the past 11,000 years along one or more of its segments or branches and "well-defined," that is, having a clearly detectable trace at or just below the ground surface (Bryant and Hart 2007).

Ward Valley is about 50 mi (80 km) to the southeast of the East Bullion and Mesquite Lake sections of the Pisgah-Bullion Fault Zone in San Bernardino County. The fault zone is part

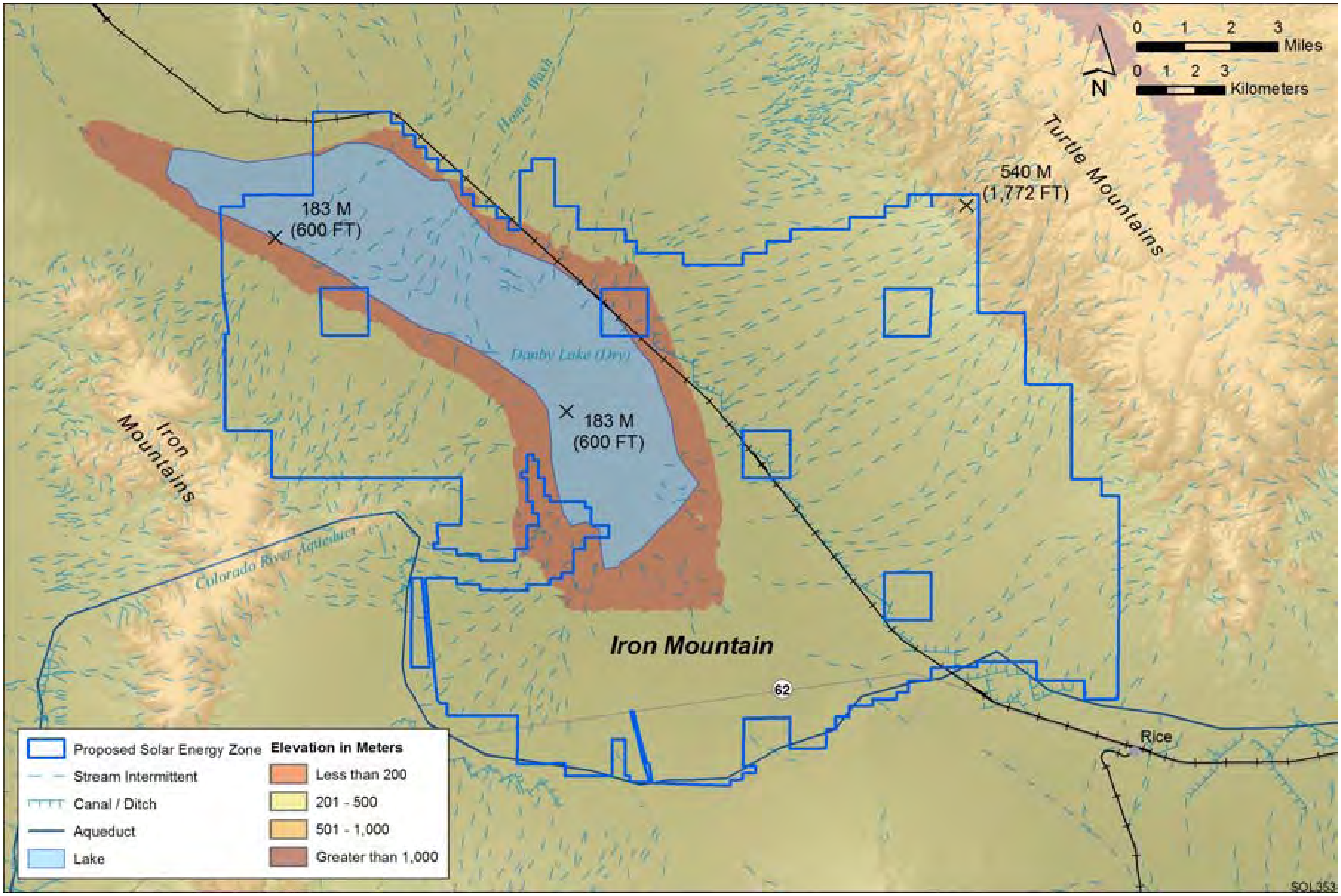

FIGURE 9.2.7.1-3 General Terrain of the Proposed Iron Mountain SEZ

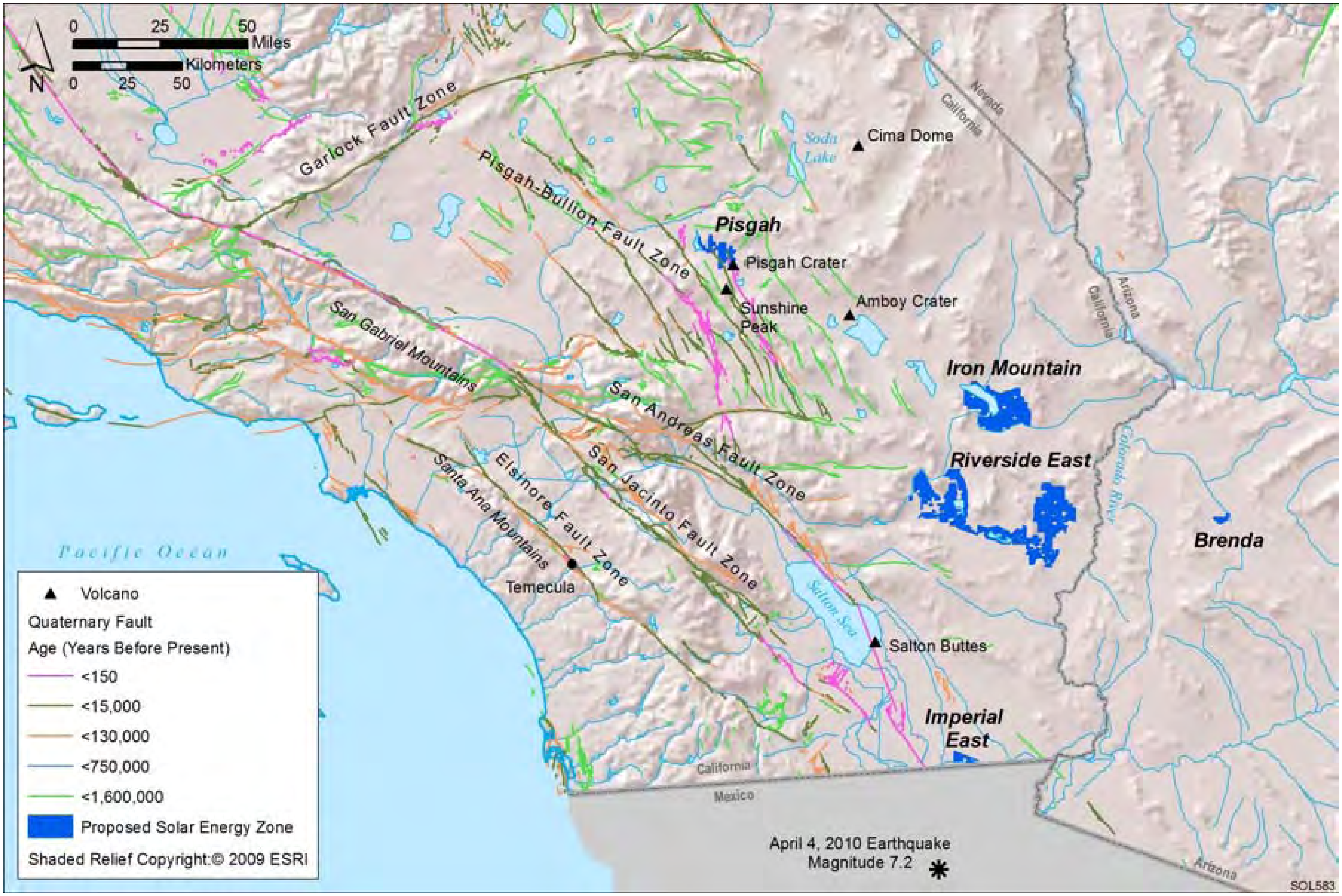

FIGURE 9.2.7.1-4 Quaternary Faults and Volcanoes in Southern California (Sources: USGS and CGS 2009; USGS 2010d)

of a complex of right-lateral strike-slip faults occurring within the Eastern California Shear Zone. Offsets of late Pleistocene and Holocene alluvial, lacustrine, and eolian deposits place the most recent movement along these sections at less than 15,000 years ago. Movement with ground rupture in the northern part of the Mesquite Lake section was reported in 1999 (the Hector Mine earthquake) with a magnitude of 7.1 (Bryant and Hart 2007; Treiman 2003; Bryant 2003).

The Coachella Valley and San Bernardino Mountains sections of the San Andreas Fault Zone are located about 65 mi (105 km) to the southwest of Ward Valley. The fault zone is a network of historically active right-lateral strike-slip faults that together compose the transverse boundary between the North American and Pacific plates. It stretches along most of California's coastline southeast to the northern Transverse Range and inland to the Salton Sea (Figure 9.2.7.1-4). Two major historic earthquakes have occurred along the San Andreas—the 1857 Fort Tejon earthquake (magnitude 7.9) and the 1906 San Francisco earthquake (magnitude 7.8). Several smaller surface-rupturing earthquakes have also occurred in historic time. Quaternary to Holocene creep rates ranging from 23 to 35 mm/yr have been reported for the Coachella Valley and San Bernardino Mountains sections of the fault zone. Average recurrence intervals are estimated to range from 150 to 275 years for the San Bernardino Mountains section and 207 to 233 years for the Coachella Valley section (Bryant and Lundberg 2002a,b; Matti et al. 1992; USGS 1988). The USGS (1988) estimates that the most recent activity along the Coachella Valley section was about 1,680 ± 40 years ago.

Since 1974, about 57 earthquakes have been recorded within a 61-mi (100-km) radius of the Iron Mountain SEZ. During this period, 30 (53%) of the recorded earthquakes had magnitudes greater than 3.0; none were greater than 3.9 (USGS 2010c).

Liquefaction. The proposed Iron Mountain SEZ lies within an area where the peak horizontal acceleration with a 10% probability of exceedance in 50 years is between 0.10 and 0.20 g. Shaking associated with this level of acceleration is generally perceived as weak to light; damage to structures would not be expected (USGS 2008b).

A regional evaluation for liquefaction hazards was completed for the San Bernardino Valley and vicinity in western San Bernardino County by Matti and Carson (1991); the study did not include the eastern part of San Bernardino County where the Iron Mountain SEZ is located. San Bernardino Valley is located between the San Andreas and San Jacinto Fault Zones where the peak horizontal acceleration with a 10% probability of exceedance in 50 years is much higher (between 0.88 and 1.62 g) than that calculated for Ward Valley; therefore, only general conclusions from the study are presented here.

The evaluation considered three aspects of liquefaction: (1) susceptibility, (2) opportunity, and (3) potential. Susceptibility identifies sedimentary materials that are likely to liquefy during a seismic event on the basis of their physical properties, depth to groundwater, expected earthquake magnitude, and strength of ground shaking. Opportunity considers the recurrence intervals for earthquake shaking strong enough to cause liquefaction in susceptible materials. The potential for ground failure due to liquefaction evaluation then combines the results of the susceptibility and opportunity evaluations and identifies areas that are most and least likely to experience liquefaction (Matti and Carson 1991).

Investigators found that the level of liquefaction susceptibility was most dependent on two factors: (1) depth to the groundwater table and (2) the intensity and duration of ground shaking as determined by an earthquake's magnitude and the distance from the causative fault. These factors, in combination with penetration-resistance data from various locations within the San Bernardino valley, allowed them to conclude that liquefaction susceptibility gradually decreases with increasing depth to groundwater, increasing distance away from the causative fault, and increasing geologic age (and induration) of sedimentary materials. Although the playa sediments at Danby Lake could be considered susceptible to liquefaction since groundwater occurs near the surface (Section 9.2.9.1.2), the low intensity of ground shaking estimated for the general area indicates that the potential for liquefaction in Ward Valley sediments is also likely to be low.

Volcanic Hazards. The nearest volcanoes are in the Amboy Crater and lava field (part of the Lavic Lake volcanic field), about 40 mi (65 km) northwest of the Iron Mountain SEZ and immediately northwest of Bristol Dry Lake (Figure 9.2.7.1-4). Amboy Crater is a 250-ft (76-m) high complex basaltic cinder cone surrounded by about 24.1 mi^2 (62 km^2) of mafic lava flows. The basalt fields erupted from several vents about 10,000 years ago. Hazards resulting from these eruptions would likely be less severe than those from more silicic sources; they include the formation of cinder cones, small volumes of tephra, and lava flows (Parker 1963; Miller 1989).

The Pisgah Crater (also part of the Lavic Lake volcanic field) is immediately adjacent to the southeast corner of the Pisgah SEZ, about 75 mi (120 km) northwest of the Iron Mountain SEZ (Figure 9.2.7.1-4). The 328-ft (100-m) high cinder cone is the youngest vent in the basalt field. Lava flows issuing from vents within the basalt field sit above alluvial fan and playa lake deposits. A similar, lesser known cinder cone and lava field also is present in the Sunshine Peak area, about 6 mi (10 km) to the south. Researchers date the most recent activity associated with the Pisgah volcano to about 25,000 years ago (Smithsonian 2010; Bassett and Kupfer 1964). Because of the basaltic composition of the Pisgah Crater lava, hazards likely would be similar to those described for the Amboy Crater but would depend on factors such as location, size, and timing (season).

The Cima dome and volcanic field east of Soda Lake is about 80 mi (130 km) north–northwest of the Iron Mountain SEZ (Figure 9.2.7.1-4). The volcanic field consists of about 40 basaltic cones and more than 60 associated mafic lava flows covering an area of about 58 mi^2 (150 km^2). It has had three periods of activity from the late Miocene through the late Pleistocene, the most recent having occurred about 15,000 years ago (Dohrenwend et al. 1984). Because of the basaltic nature of the Cima volcanic field, hazards associated with it would likely be similar to those described for the Lavic Lake volcanic field, but would depend on factors such as location, size, and timing (season).

The nearest active volcano is Mount St. Helens in the Cascade Range (Washington), about 905 mi (1,460 km) north–northwest of Ward Valley, which has shown some activity as recently as 2008. The nearest volcano that meets the criterion for an unrest episode is the Long Valley Caldera in east-central California, about 320 mi (515 km) northwest, which has experienced recurrent earthquake swarms, changes in thermal springs and gas emissions, and uplift since 1980 (Diefenbach et al. 2009). The Long Valley Caldera is part of the Mono-Inyo Craters volcanic chain that extends from Mammoth Mountain (on the caldera rim) northward about 25 mi (40 km) to Mono Lake. Small to moderate eruptions have occurred at various sites along the volcanic chain in the past 5,000 years at intervals ranging from 250 to 700 years. Windblown ash from some of these eruptions is known to have drifted as far east as Nebraska. While the probability of an eruption within the volcanic chain in any given year is small (less than 1%), serious hazards could result from a future eruption. Depending on the location, size, timing (season), and type of eruption, hazards could include mudflows and flooding, pyroclastic flows, small to moderate volumes of tephra, and falling ash (Hill et al. 1998, 2000; Miller 1989).

Earthquake swarms also occurred at Medicine Lake Volcano in northern California (Cascade Range) for a few months in 1988. Medicine Lake is about 620 mi (1,000 km) northwest of the Iron Mountain SEZ (Diefenbach et al. 2009). The most recent eruption at Medicine Lake was rhyolitic in composition and occurred about 900 years ago (USGS 2010c). Nearby Lassen Peak last erupted between 1914 and 1917; at least two blasts during this period produced mudflows that inundated the valley floors of Hut and Lost Creeks to the east. Tephra from the most violent eruption, occurring on May 22, 1915, was carried by prevailing winds and deposited as far as 310 mi (500 km) to the east (Miller 1989).

Slope Stability and Land Subsidence. The incidence of rock falls and slope failures can be moderate to high along mountain fronts and can present a hazard to facilities on the relatively flat terrain of valley floors like Ward Valley if they are located at the base of steep slopes. The risk of rock falls and slope failures decreases toward the flat valley center.

No land subsidence monitoring has been conducted within the Ward Valley to date; however, 32- to 64-ft (10- to 20-m) long earth fissures and 3-ft (1-m) wide sinkholes associated with subsidence have been documented in the Temecula area of southwestern Riverside County, about 124 mi (200 km) southwest of the proposed Iron Mountain SEZ (Figure 9.2.7.1-4). The subsidence is the result of groundwater overdrafts in the Temecula-Wolf Valley that have caused differential compaction in the sediments of the underlying aquifer. Land failure caused by sinkholes and fissures has been significant enough to damage buildings, roads, potable water and sewer lines, and other infrastructure (Corwin et al. 1991; Shlemon 1995). Land subsidence has also been documented as far back as the 1970s in southern California's San Joaquin Valley, where the maximum subsidence due to extensive groundwater withdrawals for irrigation is greater than 28 ft (9 m) (Galloway et al. 1999) and in the Wilmington Oil Field as a result of oil extraction from the Los Angeles basin in southern Los Angeles County (Kovach 1974).

Other Hazards. Other potential hazards at the Iron Mountain SEZ include those associated with soil compaction (restricted infiltration and increased runoff), expanding clay soils (destabilization of structures), and hydro-compactable or collapsible soil (settlement).

Disturbance of soil crusts and desert varnish on soil surfaces may also increase the likelihood of soil erosion by wind.

Alluvial fan surfaces, such as those typical of Ward Valley, can be the sites of damaging high-velocity flash floods and debris flows during periods of intense and prolonged rainfall. The nature of the flooding and sedimentation processes (e.g., streamflow versus debris flow) will depend on the specific morphology of the fan (National Research Council 1996).

9.2.7.1.2 Soil Resources

Because soil mapping is not complete for the Mojave Desert area, the map unit composition within the proposed Iron Mountain SEZ has not been delineated. Therefore, only soil series are shown in Figure 9.2.7.1-5 and described in Table 9.2.7.1-1. Soils within the SEZ are predominantly gravelly alluvial sands and fine- to medium-grained eolian sands, which together make up about 81% of the site's soil coverage. These soils are characterized as deep and excessively well-drained, with low to high surface-runoff potential and moderate to rapid permeability. The poorly drained soils of Danby Lake make up about 18% of the site's soil coverage. These soils are composed of brine-saturated clay with some silt, fine-grained sand, and evaporite deposits (Moyle 1967; Gale 1951). The fine- to medium-grained sands are highly susceptible to wind erosion, and soil components of clay, silt, and sand could generate fugitive dust if disturbed. Biological soil crusts and desert pavement have not been documented in the SEZ, but they may be present.

9.2.7.2 Impacts

Impacts on soil resources would occur mainly as a result of ground-disturbing activities (e.g., grading, excavating, and drilling), especially during the construction phase of a solar project. These impacts include soil compaction, soil horizon mixing, soil erosion and deposition by wind, soil erosion by water and surface runoff, sedimentation, and soil contamination. Such impacts are common to all utility-scale solar energy facilities in varying degrees and are described in more detail for the four phases of development in Section 5.7 .1.

Because impacts on soil resources result from ground-disturbing activities in the project area, soil impacts would be roughly proportional to the size of a given solar facility, with larger areas of disturbed soil having a greater potential for impacts than smaller areas (Section 5.7.2). The magnitude of impacts would also depend on the types of components built for a given facility, because some components would involve greater disturbance and would take place over a longer time frame.

Danby Lake may not be a suitable location for construction, because lakebed sediments are often saturated with shallow groundwater and likely collapsible. The lake sits within the lowest elevation area of Ward Valley and (especially its southwestern edge) serves as a sump for drainage in the valley.

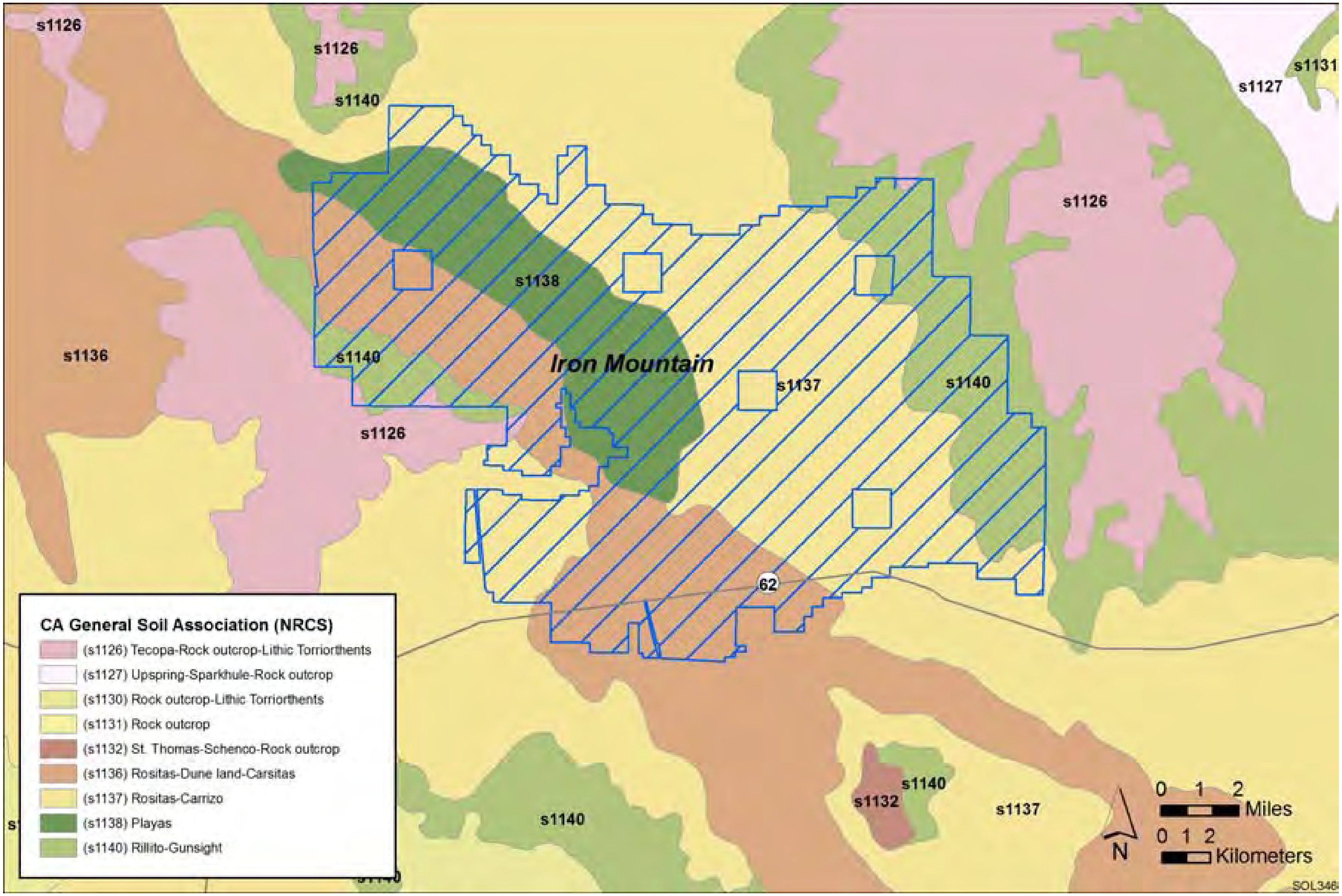

FIGURE 9.2.7.1-5 Soil Map for the Proposed Iron Mountain SEZ (Source: NRCS 2008)

TABLE 9.2.7.1-1 Summary of Soil Series within the Proposed Iron Mountain SEZ

Map Unit Symbol	Map Unit Name	Water Erosion Potential	Wind Erosion Potential	Description	Area in Acres[b] (% of SEZ)
s1137	Rosita-Carrizo	–[a]	–[a]	*Rositas series* are gently sloping soils on dunes and sand sheets (gradients of 0 to 30%). Very deep and somewhat excessively drained with low surface runoff potential (high infiltration rate) and rapid permeability. Typically fine sand. *Carrizo series* are gently sloping soils on floodplains, alluvial fans, fan piedmonts, and bolson floors (gradients of 0 to 15%). Parent material consists of alluvium from mixed sources. Very deep and excessively drained with negligible to very low surface runoff potential and rapid to very rapid permeability. Typically extremely gravelly sand. Aridic soil moisture regime. Used mainly as rangeland and wildlife habitat.	46,028 (43)
s1136	Rositas-Dune land-Carsitas	–	–	*Rositas series* as described above. *Dune land* soils are constantly shifting medium-grained sand deposited by wind blowing across the valley. Parent material consists of eolian sands. Little or no vegetation; very rapid permeability. *Carsitas series* are nearly level to strongly sloping soils on alluvial fans, moderately steep valley fills, and dissected alluvial fan remnants. Excessively drained with slow surface runoff (except during torrential events) and rapid permeability. Typically gravelly sand. Used for watershed and recreation; commercial source of sand and gravel.	24,398 (23)
s1138	Playas	–	–	Very poorly drained soils formed in flats and closed basins; moderately to strongly saline. Medium surface runoff potential and low permeability.	19,054 (18)

TABLE 9.2.7.1-1 (Cont.)

Map Unit Symbol	Map Unit Name	Water Erosion Potential	Wind Erosion Potential	Description	Area in Acres[b] (% of SEZ)
s1140	Rillito-Gunsight	–	–	*Rillito series* are nearly level to gently sloping soils on fan terraces (gradients of 0 to 3%). Deep and well-drained soils with low to medium surface runoff potential and moderate to moderately rapid permeability. *Gunsight series* are gently sloping to sloping soils on fan or stream terraces (gradients of 0 to 60%). Very deep and somewhat excessively drained with very low to high surface runoff potential and moderate to moderately rapid permeability. Aridic soil moisture regime. Typically very gravelly loam. Used mainly for livestock grazing and recreation.	16,487 (15)
s1126	Tecopa-Rock outcrop Lithic torriorthents	–	–	*Tecopa series* are sloping soils on low hills and low mountain side slopes (gradients of 15 to 75%). Very shallow and well-drained soils formed in residuum and colluvium weathered from metamorphic rocks with medium to rapid surface runoff and moderate permeability. Typically very gravelly sandy loam. Used mainly as desert rangeland. *Rock outcrop* occurs as low ridges or boulder piles and consists of variable rock types. Rapid surface runoff and barren of vegetation. *Lithic Torriorthents* are sloping soils on steep hill and mountain side slopes (gradients 15 to 60% or more) with rapid surface runoff. Typically very gravelly sand loam or loam.	556 (<1)

[a] A dash indicates water and wind erosion potential not rated at the Soil Series taxonomic level.

[b] To convert acres to lcm, multiply by 0.004047.

Source: NRCS (2006).

9.2.7.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features were identified for soil resources at the proposed Iron Mountain SEZ. Implementing the programmatic design features described in Appendix A, Section A.2.2., as required under BLM's Solar Energy Program, would reduce the potential for soil impacts during all project phases.

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9.2.8 Minerals (Fluids, Solids, and Geothermal Resources)

9.2.8.1 Affected Environment

There are no locatable mining claims (BLM and USFS 2010a), or oil and gas or geothermal leases (BLM and USFS 2010b) within the proposed Iron Mountain SEZ. The public land in the SEZ was closed to locatable mineral entry in June 2009, pending the outcome of this solar energy PEIS. In the past much of the area was leased for oil and gas, but no development occurred and the leases were closed. The area is still open for discretionary mineral leasing, including leasing for oil and gas and other leasable and salable minerals. There are sources of sand and gravel within the area that, although not currently economical to develop, could be economical in the future.

Danby Lake in the northwest corner of the SEZ contains about 28,000 acres (113 km^2) of public land that has been determined by the BLM to contain valuable sodium mineral deposits (brines). The area has been classified as the Danby Lake KSLA in accordance with the criteria and review process defined in federal regulations contained in 43 CFR Part 2400. Through a lengthy process—including scientific analysis, administrative decision making, and publication in the *Federal Register*—in 1983 the KSLA was determined to be chiefly valuable for development of the sodium mineral resources to foster the economy of the nation by industrial and mineral development. Under this classification multiple use management may allow for uses other than sodium mineral development, but only if other uses do not interfere with or restrict the production of sodium minerals.

The production of sodium from the KSLA has been ongoing for many years. The main production method has been to pump underground salt brine into evaporation pits that are constructed on the surface of the dry lakebed of Danby Lake and to collect the salt after the water has evaporated. This process is relatively unobtrusive since large structures are not required to harvest the sodium. About 23,000 acres (93 km^2) of the KSLA is within the boundary of the SEZ. Within the SEZ area, there currently are three active and two pending sodium leases.

9.2.8.2 Impacts

If the BLM identifies the area as an SEZ to be used for utility-scale solar development, it would continue to be closed to all incompatible forms of mineral development, with the exception of the KSLA where sodium development is the priority use. Since there are no oil and gas or geothermal leases in the area, it is assumed there would be no significant impacts on these resources if the area were developed for solar energy production. Also, since the area does not contain existing mining claims, it is assumed there would be no loss of locatable mineral production there in the future.

The existing classification of about 23,000 (93 km^2) acres of the SEZ as a KSLA makes that portion of the SEZ unavailable for solar development unless the BLM makes a determination that solar development could be done in such a way that is not inconsistent with the production of sodium, or unless a decision is made that solar energy production should be the dominant use for all or a portion of the area. Additionally, physical conditions on the Danby Lake lakebed do not appear to be conducive to solar development because of periodic flooding, long periods when the lakebed is too wet to support travel, and because of the presence of highly concentrated salt brine, which is corrosive to metals.

If the area is identified as a solar energy development zone, in addition to the continued extraction of sodium, some other mineral uses might be allowed on all or portions of the SEZ. For example, oil and gas development that involves the use of directional drilling to access resources under the area (should any be found) might be allowed. Also, the production of common minerals, such as sand, gravel, and mineral materials for road construction, might take place in areas not directly developed for solar energy production.

9.2.8.3 SEZ-Specific Design Features and Design Feature Effectiveness

Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would provide adequate mitigation for some identified impacts. The exceptions may be impacts on the KSLA and on the availability of sand and gravel to support construction of roads and infrastructure within the SEZ.

Proposed design features specific to the proposed SEZ include the following:

- The presence of the KSLA must be addressed to evaluate the compatibility of solar development in the KSLA with respect to continuation of sodium mineral leasing. This would likely involve analysis of the physical suitability of the KSLA for solar development, an evaluation of the sodium resource and methods available for its extraction, and a land use planning and decision process to allocate future use of the current KSLA. Alternatively, the KSLA could be excluded from the SEZ.

- Planning and identification for retention of sand and gravel resources within the SEZ should be completed prior to authorization of solar energy ROWs.

9.2.9 Water Resources

9.2.9.1 Affected Environment

The proposed Iron Mountain SEZ is located within the Southern Mojave-Salton Sea subbasin of the California hydrologic region (USGS 2010b) and the Basin and Range physiographic province characterized by intermittent mountain ranges and desert valleys (Planert and Williams 1995). The semi-enclosed Ward Valley encompasses the proposed SEZ and is bounded by the Turtle Mountains to the east and the Iron Mountains to the west. Surface elevations range from 600 to 1650 ft (183 to 503 m); lower elevations occur near the center of the valley. This region is located within the Mojave Desert, which is characterized by extreme daily temperature ranges and low precipitation and humidity (CDWR 2009). Most of the precipitation in this region falls during the winter months of November to March, with a general trend in annual precipitation amounts increasing with elevation from 3.6 in. (9 cm) in the valleys up to 12 in. (30.5 cm) in the mountains (MWD 2001). Evaporation rates are high in this region, with an average annual pan evaporation value of 130 in./yr (330 cm/yr) (Cowherd et al. 1988; WRCC 2010a).

9.2.9.1.1 Surface Waters (Including Drainages, Floodplains, and Wetlands)

The primary surface water features within the proposed Iron Mountain SEZ are several ephemeral washes coming off the Iron Mountains and Turtle Mountains that drain to the Danby Lake region, which covers approximately 31.5 mi^2 (81.5 km^2) of the northwestern portion of the proposed SEZ (Figure 9.2.9.1-1). Danby Lake is an internal drainage area for the Ward Valley and is a region of active salt mining that can be inundated intermittently throughout the year because of natural drainage, releases from the Colorado River Aqueduct (CRA) during maintenance periods, and mining-induced flooding (see Section 9.2.8.1 for more details on mining operations). Homer wash, an intermittent stream, flows north to south along the middle of the Ward Valley, meeting Danby Lake at the northern boundary of the proposed SEZ. The CRA follows the southern boundary of the proposed Iron Mountain SEZ. The CRA delivers Colorado River water from a diversion near Parker Dam on the California–Arizona border (approximately 43 mi [69 km] northeast of the proposed SEZ) to municipalities and water districts of southern California. The CRA conveys flows that range from 550,000 ac-ft/yr up to 1.3 million ac-ft/yr (0.7 billion to 1.6 billion m^3/yr) (MWD 2008). Cadiz Lake, a dry lake, is 6 mi (10 km) west of the proposed SEZ in the adjacent Cadiz Valley.

Flood hazards have not been identified (Zone D) for the region surrounding the proposed Iron Mountain SEZ (FEMA 2009). Intermittent flooding may occur along ephemeral washes and the Danby Lake region (lowest elevation) with temporary ponding and erosion. No wetlands have been identified within the proposed SEZ according to the NWI (USFWS 2009). One intermittently flooded, riverine wetland that covers an area of 74 acres (0.3 km^2) is located 5 mi (8 km) to the south of the proposed SEZ (Figure 9.2.9.1-1).

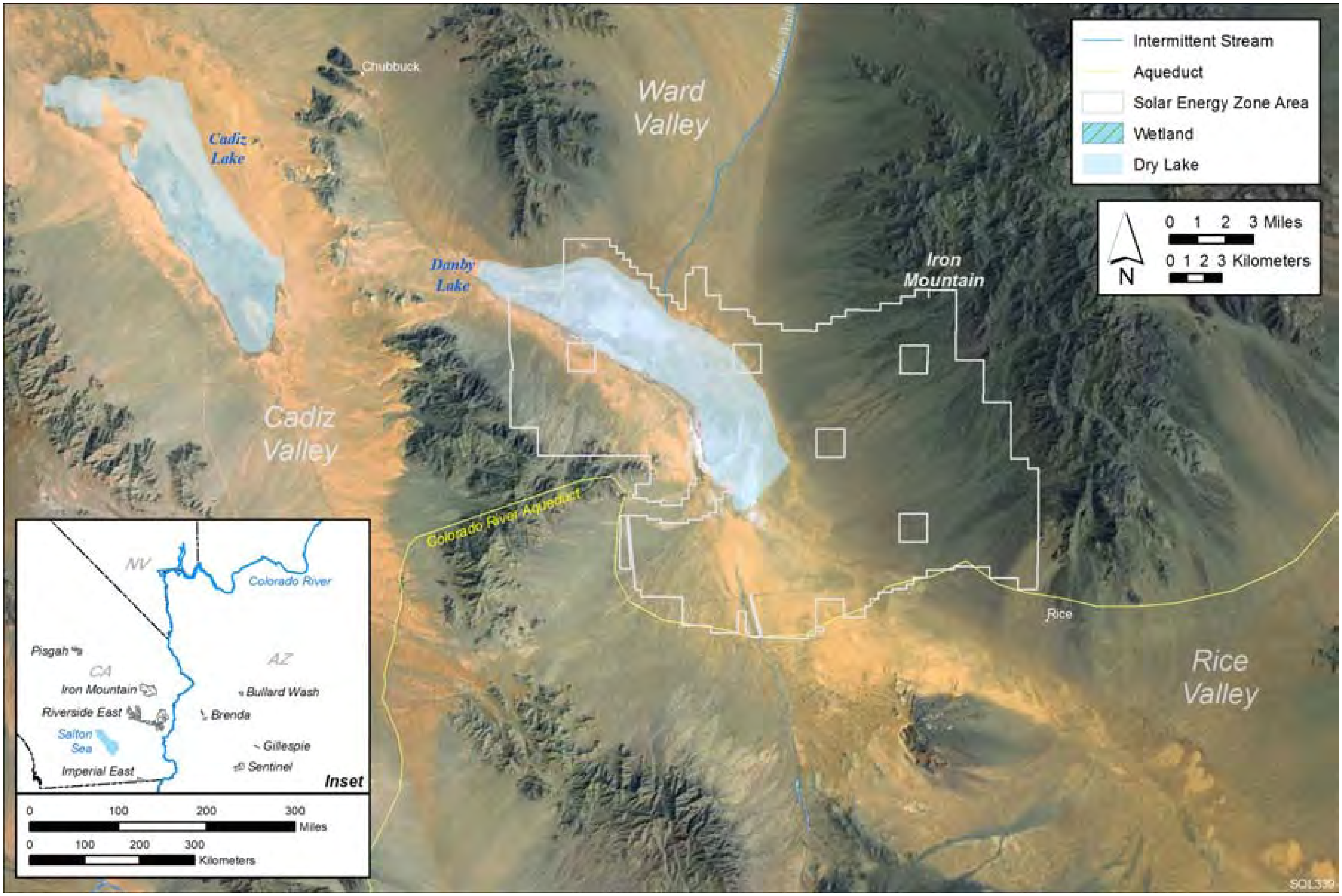

FIGURE 9.2.9.1-1 Surface Water Features near the Proposed Iron Mountain SEZ

9.2.9.1.2 Groundwater

The majority (98%) of the proposed Iron Mountain SEZ is located within the Ward Valley groundwater basin with the southeastern corner (2%) located in the Rice Valley groundwater basin. The Ward Valley and Rice Valley groundwater basins are connected by a low-lying alluvial drainage divide. Groundwater is primarily found in alluvium, alluvial fan, and playa deposits of Holocene and Pleistocene age sediments. These basin-fill aquifers are typically unconfined and can range up to 2000 ft (610 m) in thickness. The alluvial deposits consist of unconsolidated sand, pebbles, and boulders with varying amounts of silts and clays; the fan deposits consist of moderately consolidated gravels, sand, silt, and clay; and the playa deposits consist primarily of sand, silt, and soluble salts (CDWR 2003, groundwater basin number 7-03).

From a regional perspective, groundwater recharge in the eastern Mojave Desert is largely supplied by rainfall and snowmelt runoff at higher elevations, and groundwater discharge is primarily through interbasin flows and evaporation from low-elevation playas (MWD 2001). Information on the groundwater aquifers in the Ward Valley is limited because of the historically low level of development in this region. The groundwater storage capacity for the Ward Valley groundwater basin is estimated to be 8.7 million ac-ft (11 billion m^3) based on the basin size and estimates of alluvium depths. The natural groundwater recharge is estimated to be 2,700 ac-ft/yr (3.3 million m^3/yr), and the groundwater discharge at Danby Lake is estimated to range from 11,000 to 22,000 ac-ft/yr (13.6 million to 27.2 million m^3/yr) (CDWR 2003). Historical groundwater withdrawals have been used to support small farms and vineyards, railroads, and salt-mining industries (MWD 2001). Between 1901 and 1947 groundwater withdrawals averaged 50 ac-ft/yr (61,700 m^3/yr) but dropped off because of the railroads' switch from steam to diesel engines; currently they range from 2 to 8 ac-ft/yr (2,500 to 9,900 m^3/yr) (MWD 2001; CDWR 2003).

Groundwater levels range from near the surface at Danby Lake to 700 ft below the surface (CDWR 2003). A USGS monitoring well located on the northwest corner of the proposed SEZ showed steady groundwater levels at 93 ft (28 m) below the surface from 1964 to 1984 (USGS 2009, well number 341627115102901). Other USGS wells within the adjacent Cadiz Valley and Rice Valley groundwater basins have shown steady groundwater levels as well (USGS 2009, well numbers 340500114505801, 340424114484801, 340300114473301, 342513115220001). Well yields between 10 and 260 gpm (38 and 984 L/min) have been reported within the Ward Valley groundwater basin (CDWR 2003). Cadiz, Inc., reported total groundwater yields of up to 3,700 gpm (14,000 L/min) for its agricultural production wells, which are located 25 mi (40 km) northwest of the proposed SEZ in the Cadiz Valley groundwater basin (MWD 2001). The groundwater quality in this region typically has TDS concentrations of 300 to 500 mg/L, with the exception of the playa deposits near the dry lakebeds. Danby Lake and other dry lakes within the region have reported TDS values up to 298,000 to 321,000 mg/L (MWD 2001; CDWR 2003).

9.2.9.1.3 *Water Use and Water Rights Management*

In 2005, water withdrawals from surface waters and groundwater in San Bernardino County were 656,900 ac-ft/yr (860 million m^3/yr), of which 57% came from surface waters and 43% came from groundwater. The largest water use category was municipal and domestic supply, at 427,100 ac-ft/yr (527 million m^3/yr). However, the majority of this water is used in the larger cities located in the southwestern portion of San Bernardino County. Agricultural water uses accounted for 167,000 ac-ft/yr (206 million m^3/yr), while industrial and thermoelectric water uses accounted for 29,150 and 33,630 ac-ft/yr (36 million and 41 million m^3/yr), respectively (Kenny et al. 2009).

California uses a "plural" system to manage water resources: a mixture of riparian and prior appropriation doctrines for surface waters, a separate doctrine for groundwater, and pueblo rights (BLM 2001). Several agencies are involved with the management of California's water resources, including federal, state, local, and water/irrigation districts. For example, water rights and water quality are managed by the State Water Board, while the Department of Water Resources manages water conveyance, infrastructure, and flood management (CDWR 2009). Surface water appropriations, for nonriparian rights, begin with a permit application to the State Water Board and a review process that examines the application's beneficial use, pollution potential, and water quantity availability; the permitting, review, and licensing procedure should not take more than 6 months to complete unless the application is protested (BLM 2001).

Groundwater management in California is primarily done at the local level of government through local agencies or ordinances and also can be subject to court adjudication. State statutes provide authority and revenue mechanisms to several types of local agencies to provide water for beneficial uses, as well as to manage withdrawals in order to prevent overdraft[1] of the aquifers. Local ordinances (typically at the county level) also can be used to manage groundwater resources and have been adopted in 27 counties in California. Many of these local groundwater ordinances are focused on controlling water exports out of the basin through permitting processes. Court adjudication is the strongest form of groundwater management used in California and often results in the creation of a court-appointed "watermaster" agency to manage withdrawals for all users to ensure that the court-determined safe-yield[2] is maintained (CDWR 2003).

The CRA is managed and maintained by the MWD, a consortium of 26 municipal and water districts. The primary function of the MWD is to provide drinking water to its members, which are all located in areas of southern California approximately 100 mi (160 km) to the west of the proposed Iron Mountain SEZ. While the CRA conveys substantial water flows along the southern boundary of the proposed SEZ, this water is essentially unavailable for solar energy development because of its location outside of the MWD service area; thus, any water transfers

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[1] Groundwater overdraft is the condition where water extractions from an aquifer exceed recharge processes such that there are substantial and sustained decreases in groundwater flows and groundwater elevations.

[2] Safe-yield is the amount of groundwater that can be withdrawn from a groundwater basin over a period of time without exceeding the long-term recharge of the basin or unreasonably affecting the basin's physical and chemical integrity.

would have to be approved by the MWD board (MWD 2009, Section 4200). Continued low water levels in Lake Mead affect the surplus water supplies provided to the MWD by the Bureau of Reclamation from the Colorado River; in addition, population growth and water supply demands in the MWD service area suggest that water from the CRA would not be made available for uses outside the MWD service area by the member agencies that compose the MWD board (MWD 2008).

The primary water resource available to the proposed Iron Mountain SEZ is groundwater, which is managed through the San Bernardino County groundwater ordinance (Groundwater Management Act, Water Code Section 10750 et seq.). Any water withdrawals greater than 30 ac-ft/yr (37,000 m^3/yr) are subject to a full review process in accordance with the California Environmental Quality Act. The permitting and review process requires the applicant to provide detailed information on the groundwater aquifer, including estimated storage capacity, recharge conditions, water quality, and the anticipated safe-yield. Conditions of approval for the groundwater withdrawal permit may include mitigation actions, as well as the establishment of a groundwater monitoring plan.

9.2.9.2 Impacts

Potential impacts on water resources related to utility-scale solar energy development include direct and indirect impacts on surface waters and groundwater. Direct impacts occur at the place of origin and at the time of the proposed activity, while indirect impacts occur away from the place of origin or later in time. Impacts on water resources considered in this analysis are the result of land disturbance activities (construction, final developed site plan, as well as off-site activities such as road and transmission line construction) and water use requirements for solar energy technologies that take place during the four project phases: site characterization, construction, operations, and decommissioning/reclamation. Both land disturbance and consumptive water use activities can affect groundwater and surface water flows, cause drawdown of groundwater surface elevations, modify natural drainage pathways, obstruct natural recharge zones, and alter surface water-wetland-groundwater connectivity. Water quality also can be degraded through the generation of wastewater, chemical spills, increased erosion and sedimentation, and increased salinity (e.g., by the excessive withdrawal from aquifers).

9.2.9.2.1 Land Disturbance Impacts on Water Resources

Impacts related to land disturbance activities are common to all utility-scale solar energy facilities, which are described in more detail for the four phases of development in Section 5.9.1; these impacts will be minimized through the implementation of the programmatic design features described in Appendix A, Section A.2.2. In addition to the hydrologic evaluation (including identifying 100-year floodplains and jurisdictional waters) described in the design features, coordination and permitting with the CDFG would be needed for any proposed alterations of surface water features (both perennial and ephemeral) in accordance with the Lake and Streambed Alteration Program (CDFG 2010c). The Danby Lake region is the natural drainage outlet for the Ward Valley; the playa sediments contain high soluble salts concentrations. Siting of solar energy facilities in the Danby Lake region could affect the natural drainage patterns of the Ward Valley. As this region is the valley's drainage outlet, facilities here could cause flooding, channel incision, and erosion in upstream drainages. Additionally, the intermittent inundation that occurs in Danby Lake is important to groundwater recharge and discharge processes. Groundwater development in the Danby Lake region would not be feasible for solar energy development because of the very high TDS values (greater than 300,000 mg/L), as well as the shallow groundwater depths in playa sediments that if developed could potentially cause land subsidence.

9.2.9.2.2 Water Use Requirements for Solar Energy Technologies

Analysis Assumptions

A detailed description of the water use assumptions for the four utility-scale solar energy technologies (parabolic trough, power tower, dish engine, and PV systems) is presented in Appendix M. Assumptions regarding water use calculations specific to the proposed Iron Mountain SEZ are as follows:

- On the basis of a total area of greater than 30,000 acres (121 km^2), it is assumed that three solar projects would be constructed during the peak construction year;

- Water needed for making concrete would come from an off-site source;

- The maximum land area disturbed for an individual solar facility during the peak construction year is assumed to be 3,000 acres (12 km^2);

- Assumptions on individual facility size and land requirements (Appendix M), along with the assumed number of projects and maximum allowable land disturbance, results in the potential to disturb up to 8% of the total area of the proposed SEZ;

- Water use requirements for hybrid cooling systems are assumed to be on the same order of magnitude as those using dry-cooling systems (see Section 5.9.2.1); and

- Water from the CRA is assumed to be unavailable to solar energy facilities because of two factors: (1) the mechanisms to obtain CRA water would have to be negotiated with the MWD board on a project-specific basis and (2) current water demands by MWD member agencies suggest minimal water is available.

Site Characterization

During site characterization, water would be used mainly for controlling fugitive dust and for providing the workforce potable water supply. Impacts on water resources during this phase of development are expected to be negligible since activities would be limited in area, extent, and duration; water needs could be met by trucking water in from an off-site source.

Construction

During construction, water would be used mainly for controlling fugitive dust and for providing the workforce potable water supply. Because there are no significant surface water bodies on the proposed Iron Mountain SEZ, the water requirements for construction activities could be met by either trucking water to the sites or by using on-site groundwater resources. Water requirements for dust suppression and potable water supply during construction are shown in Table 9.2.9.2-1 and could be as high as 6,813 ac-ft (8.4 million m^3). Groundwater wells would have to yield an estimated 2,896 to 4,221 gpm (10,963 to 15,978 L/min) to meet the estimated construction water requirements. These yields are on the order of large municipal and agriculture production wells (Harter 2003), so multiple wells may be needed in order to obtain the water requirements. In addition, the generation of up to 222 ac-ft (273,800 m^3) of sanitary wastewater would need to be treated either on-site or sent to an off-site facility.

Information on the available groundwater resources in the Ward Valley groundwater basin is limited because of the historically low development of the region. The estimated total water use requirements during construction are on the order of 1.7 to 2.5 times greater than the estimated natural recharge value of the basin. Groundwater levels have remained steady for decades, but in that time period the highest level of groundwater production has only reached

TABLE 9.2.9.2-1 Estimated Water Requirements during the Peak Construction Year for the Proposed Iron Mountain SEZ

Activity	Parabolic Trough	Power Tower	Dish Engine	PV
Water use requirements[a]				
Fugitive dust control (ac-ft)[b,c]	4,452	6,678	6,678	6,678
Potable supply for workforce (ac-ft)	222	135	56	28
Total water use requirements (ac-ft)	4,674	6,813	6,734	6,706
Wastewater generated				
Sanitary wastewater (ac-ft)	222	135	56	28

[a] Assumptions of water use for fugitive dust control, potable supply for workforce, and wastewater generation are presented in Appendix M.

[b] Fugitive dust control estimation assumes a local pan evaporation rate of 130 in./yr (330 cm/yr) (Cowherd et al. 1988; WRCC 2010a).

[c] To convert ac-ft to m^3, multiply by 1,234.

50 ac-ft/yr (61,700 m^3/yr). It is likely that groundwater production at the levels needed to meet the construction requirements suggested in Table 9.2.9.2-1 would cause a substantial decline in groundwater elevations in the alluvial aquifer and, potentially, land subsidence. However, pumping tests would need to be performed during the site characterization phase to better determine the storage capacity and safe-yield of the alluvial aquifer. Additionally, concerns about groundwater quality used for the potable workforce supply would have to be addressed during site characterization. Groundwater used for potable supply must have a TDS of less than 1,500 mg/L and is recommended to be less then 500 mg/L to meet secondary maximum contaminant levels (*California Code*, Title 22, Article 16, Section 64449).

Operations

During operations, water would be required for mirror/panel washing, the workforce potable water supply, and cooling (parabolic trough and power tower only) (Table 9.2.9.2-2). Cooling water is required only for the parabolic trough and power tower technologies. Water needs for cooling are a function of the type of cooling used (dry, wet, hybrid). Further refinements to water requirements for cooling would result from the percentage of time that the option was employed (30 to 60% range assumed) and the power of the system. The differences between the water requirements reported in Table 9.2.9.2-2 for the parabolic trough and power tower technologies are attributable to the assumptions of acreage per megawatt. As a result, the water usage for the more energy-dense parabolic trough technology is estimated to be almost twice as large as that for the power tower technology.

At full build-out capacity, water needs for mirror/panel washing are estimated to range from 473 to 8,522 ac-ft/yr (583,400 to 10.5 million m^3/yr) and for the workforce potable water supply, from 11 to 239 ac-ft/yr (13,600 to 294,800 m^3/yr). The maximum total water usage during operations at full build-out capacity would be greatest for those technologies using the wet-cooling option and is estimated to be as high as 255,892 ac-ft/yr (316 million m^3/yr). Water usage for dry-cooling systems would be as high as 25,805 ac-ft/yr (32 million m^3/yr), approximately a factor of 10 times less than that for the wet-cooling option. Noncooled technologies, dish engine and PV systems, require substantially less water at full build-out capacity at 4,840 ac-ft/yr (6.0 million m^3/yr) for dish engine and 484 ac-ft/yr (597,000 m^3/yr) for PV (Table 9.2.9.2-2). Operations would produce up to 239 ac-ft/yr (294,800 m^3/yr) of sanitary wastewater; in addition, for wet-cooled technologies, up to 4,842 ac-ft/yr (6.0 million m^3/yr) of cooling system blowdown water would need to be treated either on- or off-site. Any on-site treatment of wastewater would have to ensure that treatment ponds are effectively lined in order to prevent any groundwater contamination.

The availability of groundwater resources is not well quantified in the Ward Valley because there is little development in the region, as previously mentioned. Water requirements for potable uses by the workforce are of the same order of magnitude as historical groundwater withdrawals. Water use requirements for panel washing of PV systems are a factor of 10 to 18 times less than those for mirror washing of parabolic trough, power tower, and dish engine systems. The natural estimated groundwater recharge for the Ward Valley is 2,700 ac-ft/yr (3.3 million m^3/yr), which is of the same order of magnitude as the low operation

TABLE 9.2.9.2-2 Estimated Water Requirements during Operations at Full Build-out Capacity at the Proposed Iron Mountain SEZ

Activity	Parabolic Trough	Power Tower	Dish Engine	PV
Full build-out capacity (MW)[a,b]	17,044	9,469	9,469	9,469
Water use requirements				
Mirror/panel washing (ac-ft/yr)[c,d]	8,522	4,734	4,734	473
Potable supply for workforce (ac-ft/yr)	239	106	106	11
Dry-cooling (ac-ft/yr)[e]	3,409–17,044	1,894–9,469	NA[f]	NA
Wet-cooling (ac-ft/yr)[e]	76,696–247,131	42,609–137,295	NA	NA
Total water use requirements				
Non-cooled technologies (ac-ft/yr)	NA	NA	4,840	484
Dry-cooled technologies (ac-ft/yr)	12,170–25,805	6,734–14,309	NA	NA
Wet-cooled technologies (ac-ft/yr)	85,457–255,892	47,449–142,135	NA	NA
Wastewater generated				
Blowdown (ac-ft/yr)[g]	4,842	2,690	NA	NA
Sanitary wastewater (ac-ft/yr)	239	106	106	11

a Land area for parabolic trough was estimated at 5 acres/MW (0.02 km^2/MW); land area for the power tower, dish engine, and PV technologies was estimated at 9 acres/MW (0.04 km^2/MW).

b Water needs are linearly related to power. Water usage for any other size project can be estimated by using multipliers provided in Appendix M, Table M.9-2.

c Value assumes a usage rate of 0.5 ac-ft/yr/MW for mirror washing for parabolic trough, power tower, and dish engine technologies and a rate of 0.05 ac-ft/yr/MW for panel washing for PV systems.

d To convert ac-ft to m^3, multiply by 1,234.

e Dry-cooling value assumes 0.2 to 1.0 ac-ft/yr per MW and wet-cooling value assumes 4.5 to 14.5 ac ft/yr per MW (range in these values represents 30 and 60% operating times) (DOE 2009a).

f NA = not applicable.

g Value scaled from 250-MW Beacon Solar project with an annual discharge of 44 gpm (167 L/min) (AECOM 2009). Blowdown estimates are relevant to wet cooling only.

(30% operation time) values for dry-cooling water needs. At higher operation times (60%), dry-cooling water demands are 3.5 to 6.3 times the natural groundwater recharge of the Ward Valley. Groundwater withdrawals at these levels are likely to cause drawdown in the alluvial aquifer, which could affect current salt-mining operations in the Danby Lake region that are dependent upon maintaining certain depth-to-groundwater levels. Another potential impact of drawdown in the alluvial aquifer is land surface subsidence. This is of particular concern in the region along the CRA, because cracks in the aqueduct would affect the water quantities and rights of the MWD. Further characterization of groundwater resources is needed in the Ward Valley to better quantify the safe-yield of the basin's alluvial aquifer prior to the evaluation of impacts relating to project-specific groundwater withdrawals. During site characterization, developers should coordinate with San Bernardino County in order to comply with the county's groundwater ordinance and permitting process, as well as to coordinate efforts for the further characterization of the groundwater resources in the Ward Valley basin to ensure that there is adequate groundwater supply and to limit land subsidence effects.

Wet-cooling water requirements are a factor of 2 to 11 times the highest estimate of groundwater discharge that occurs at Danby Lake and approximately 3% of the estimated groundwater storage capacity of the Ward Valley. Additionally, the highest estimated value of water required for wet cooling is approximately one-third of the 801,000 ac-ft/yr (988 million m^3/yr) conveyed by the CRA during the period 2007–2008 (MWD 2008), which supports the water needs of its 26 member agencies. These levels of water use needs for wet cooling are not feasible with the water resources available to the region surrounding the proposed Iron Mountain SEZ.

Decommissioning/Reclamation

During decommissioning/reclamation, all surface structures associated with the solar project would be dismantled, and the site reclaimed to its preconstruction state. Activities and water needs during this phase would be similar to those during the construction phase (dust suppression and potable supply for workers) and may also include water to establish vegetation in some areas. However, the total volume of water needed is expected to be less. Because quantities of water needed during the decommissioning/reclamation phase would be less than those for construction, impacts on surface and groundwater resources also would be less.

9.2.9.2.3 Off-Site Impacts of Roads and Transmission Lines

Impacts associated with the construction of roads and transmission lines primarily deal with water use demands for construction, water quality concerns relating to potential chemical spills, and land disturbance effects on the natural hydrology. A new access road would not be needed because State Route 62 passes through the southern portion of the SEZ, as described in Section 9.2.1.2. It is assumed that existing transmission lines could provide access to the transmission grid, and thus no additional acreage disturbance for transmission line access was assessed.

9.2.9.2.4 Summary of Impacts on Water Resources

The impacts on water resources associated with developing solar energy in the proposed Iron Mountain SEZ are associated with land disturbance effects on natural hydrology, water use requirements for the various solar energy technologies, and water quality associated with potable water supply. Land disturbance in the region of Danby Lake area has the potential to disrupt the natural drainage to this terminal outlet of the Ward Valley, as well as affect current salt-mining operations. Hydrology alterations in the Danby Lake area could result in upstream erosion in ephemeral washes, localized flooding and channel incision, and potential disruption of groundwater recharge and discharge processes. Additionally, the playa sediments with high soluble salts content in the Danby Lake region could produce groundwater with high TDS values, resulting in water that is nonpotable and corrosive to infrastructure.

Impacts from water use requirements vary depending on the type of solar technology built and, for technologies using cooling systems, the type of cooling (wet, dry, or hybrid) employed. Groundwater is the primary water resource available to solar energy facilities in the proposed Iron Mountain SEZ, and information on the groundwater storage capacity, as well as on recharge and discharge processes, is not well quantified because of limited historical development in the region. Given the current estimates of annual precipitation, groundwater recharge, discharge at Danby Lake, and historical groundwater withdrawals and levels in the Ward Valley, solar energy facilities using wet cooling would not be feasible because of the lack of available water resources. Additionally, the water use estimates for dry-cooling (parabolic trough and power tower) and dish engine technologies are larger than groundwater recharge estimates for the Ward Valley. Groundwater drawdown of the alluvial aquifer is likely, as well as the potential for land subsidence, which is of particular concern along the CRA. Further quantification of the groundwater safe-yield for the Ward Valley would be needed prior to the evaluation of impacts associated with project-specific groundwater withdrawals. Water use estimates for PV systems are of a similar order of magnitude of the historically highest groundwater withdrawals; this suggests that groundwater resources are adequate to support PV facilities.

The estimated values of water requirements for the solar energy technologies are a function of the full build-out capacity of the proposed SEZ. Full build-out of the large area of the proposed Iron Mountain SEZ has the theoretical potential to generate 9,469 to 17,044 MW, but would require very large water supplies for water-intensive technologies (Table 9.2.9.2-2). For the purpose of evaluating a more realistic build-out scenario reflecting the available water supplies, an estimate of the maximum power capacity for each technology was made assuming a value for available groundwater resources in the Ward Valley. While groundwater storage, safe-yield, and transport processes would need to be better quantified prior to approval of specific project plans during a site characterization phase, the current estimate of the natural groundwater recharge to the Ward Valley serves as a reasonable estimate of the available groundwater resources. Using this value of 2,700 ac-ft/yr (3.3 million m^3/yr) as an estimate of the maximum available water resources for the proposed Iron Mountain SEZ, parabolic trough and power tower technologies could expect to generate 1 to 6% (wet cooling) and 10 to 40% (dry cooling) of the of the full build-out power capacity. Dish engine facilities could produce 56% of the full build-out power capacity, while water use requirements for PV are lower than this estimate of available water resources.

9.2.9.3 SEZ-Specific Design Features and Design Feature Effectiveness

The program for solar energy development on BLM-administered lands will require that the programmatic design features in Appendix A, Section A.2.2, be implemented, thus mitigating some impacts on water resources. Programmatic design features would focus on coordination with federal, state, and local agencies that regulate the use of water resources to meet the requirements of permits and approvals needed to obtain water for development, and on hydrological studies to characterize the aquifer from which groundwater would be obtained (including drawdown effects, if a new point of diversion is created). The greatest consideration for mitigating water impacts would be in the selection of solar technologies. The mitigation of impacts would be best achieved by selecting technologies with low water demands.

Proposed design features specific to the proposed Iron Mountain SEZ include the following:

- Water resource analysis indicates that wet-cooling options would not be feasible. Other technologies should incorporate water conservation measures.

- Land disturbance activities should avoid impacts to the extent possible in the vicinity of Danby Lake to reduce impacts on the regional drainage outlet and salt-mining operations.

- During site characterization, hydrologic investigations would need to identify 100-year floodplains and potential jurisdictional water bodies subject to Clean Water Act Section 404 permitting. Siting of solar facilities and construction activities should avoid areas identified as being within a 100-year floodplain.

- During site characterization, coordination and permitting with CDFG regarding California’s Lake and Streambed Alteration Program would be required for any proposed alterations to surface water features (both perennial and ephemeral).

- The groundwater-permitting process should be in compliance with the San Bernardino County groundwater ordinance.

- Construction of groundwater production wells in the Danby Lake region should be avoided because the water is nonpotable and contains corrosive levels of TDS.

- Groundwater monitoring and production wells should be constructed in accordance with standards set forth by the State of California (CDWR 1991) and San Bernardino County.

- Stormwater management plans and BMPs should comply with standards developed by the California Stormwater Quality Association (CASQA 2003).

- Water for potable uses would have to meet or be treated to meet the water quality standards in the California Safe Drinking Water Act (*California Health and Safety Code*, Chapter 4).

9.2.10 Vegetation

This section addresses vegetation that could occur or is known to occur within the potentially affected area of the proposed Iron Mountain SEZ. The affected area considered in this assessment included the areas of direct and indirect effects. The area of direct effects was defined as the area that would be physically modified during project development (i.e., where ground-disturbing activities would occur) and included only the SEZ. The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary where ground-disturbing activities would not occur but that could be indirectly affected by activities in the area of direct effect. No areas of direct or indirect effects were assumed for new transmission lines or access roads; they are not expected to be needed for facilities on the Iron Mountain SEZ because of the proximity of an existing transmission line and state highway.

Indirect effects considered in the assessment included effects from surface runoff, dust, and accidental spills from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance away from the SEZ. This area of indirect effect was identified on the basis of professional judgment and was considered sufficiently large to bound the area that would potentially be subject to indirect effects. The affected area is the area bounded by the areas of direct and indirect effects. These areas are defined and the impact assessment approach is described in Appendix M.

9.2.10.1 Affected Environment

The proposed Iron Mountain SEZ is located within the Sonoran Basin and Range Level III ecoregion (EPA 2007), which supports creosotebush (*Larrea tridentata)* and white bursage (*Ambrosia dumosa*) plant communities with large areas of palo verde (*Cercidium microphyllum*)-cactus shrub and saguaro cactus (*Carnegiea gigantea*) communities (EPA 2002). The dominant species of the Lower Colorado River Valley subdivision of the Sonoran Desert are primarily creosotebush, white bursage, and all-scale (*Atriplex polycarpa*), with big galleta (*Pleuraphis rigida*), Palmer alkali heath (*Frankenia palmeri*), brittlebush (*Encelia farinosa*), and western honey mesquite (*Prosopis glandulosa* var. *torreyana*) dominant in some areas (Turner and Brown 1994). Larger drainageways and washes support species of small trees and shrubs that may also occur in adjacent areas, such as western honey mesquite, ironwood (*Olneya tesota*), and blue palo verde (*Cercidium floridum*) as well as species such as smoketree (*Psorothamnus spinosa*), which are mostly restricted to drainageways. Shrub species found in minor drainages include cat-claw acacia (*Acacia greggii*), burrobrush (*Hymenoclea salsola* var. *pentalepis*), Anderson thornbush (*Lycium andersonii*), and desert broom (*Baccharis sarothroides*). Annual precipitation in the Sonoran Desert occurs in winter and summer (Turner and Brown 1994) and is very low in the area of the SEZ, averaging about 3.4 in. (86.6 mm) at Iron Mountain Station (see Section 9.2.13). The Iron Mountain SEZ is in a transitional area that includes many species associated with the Mojave Desert.

Land cover types, described and mapped under CAReGAP (NatureServe 2009) were used to evaluate plant communities in and near the SEZ. Each cover type encompasses a range of similar plant communities. Land cover types occurring within the potentially affected area of the proposed Iron Mountain SEZ are shown in Figure 9.2.10.1-1. Table 9.2.10.1-1 provides the surface area of each cover type within the potentially affected area.

Lands within the Iron Mountain SEZ are classified primarily as Sonora–Mojave Creosotebush–White Bursage Desert Scrub, North American Warm Desert Playa, North American Warm Desert Wash, and North American Warm Desert Bedrock Cliff and Outcrop. Additional cover types within the SEZ are given in Table 9.2.10.1-1. Creosote was observed to be the dominant species over much of the SEZ in August 2009. Sensitive habitats on the SEZ include desert dry wash and dry wash woodlands, playa, sand dune, riparian, and desert chenopod scrub/mixed salt desert scrub habitats. Characteristic Sonoran Desert species observed on the SEZ include blue palo verde, western honey mesquite, ironwood (*Olneya tesota*), smoketree, and Ocotillo (*Fouquieria splendens*). Cacti species observed within the SEZ were golden cholla (*Opuntia echinocarpa*), beavertail prickly pear (*Opuntia basilaris*), and pencil cholla (*Opuntia arbuscula*).

The area surrounding the SEZ, within 5 mi (8 km), includes 14 cover types, which are listed in Table 9.2.10.1-1. The predominant cover types are Sonora–Mojave Creosotebush–White Bursage Desert Scrub and North American Warm Desert Bedrock Cliff and Outcrop.

There are no wetlands mapped by the NWI that occur within the SEZ or within the 5-mi (8-km) area of indirect effects. NWI maps are produced from high-altitude imagery and are subject to uncertainties inherent in image interpretation (Stout 2009). Larger washes support dense stands of woody vegetation, a small portion of which are mapped as North American Warm Desert Riparian Woodland and Shrubland and include tamarisk, western honey mesquite, blue palo verde, and ironwood. Numerous ephemeral dry washes occur within the SEZ. These dry washes typically contain water for short periods during or following precipitation events, and include temporarily flooded areas, but typically do not support wetland or riparian habitats. Danby Lake, in the northwestern portion of the SEZ, is a dry lakebed most of the year; it is inundated for 3 to 4 days during fall–winter rains in most years with a shallow summer water table 3 to 4 ft below the surface. Danby Lake is primarily classified as North American Warm Desert Playa. The occurrences of the Sonora-Mojave Mixed Salt Desert Scrub, North American Warm Desert Active and Stabilized Dune, and North American Warm Desert Volcanic Rockland cover types in the Iron Mountain SEZ are located within Danby Lake.

The proposed Iron Mountain SEZ is located within the Mojave Weed Management Area (MWMA). Table 9.2.10.1-2 provides a list of problem weed species of the MWMA.

An invasive species known to occur within the SEZ is tamarisk, which occurs along wet areas. In addition, cheatgrass and sahara mustard occur in the BLM Needles Field Office area, which includes the proposed Iron Mountain SEZ. Tamarisk and Sahara mustard are included on the MWMA weed list.

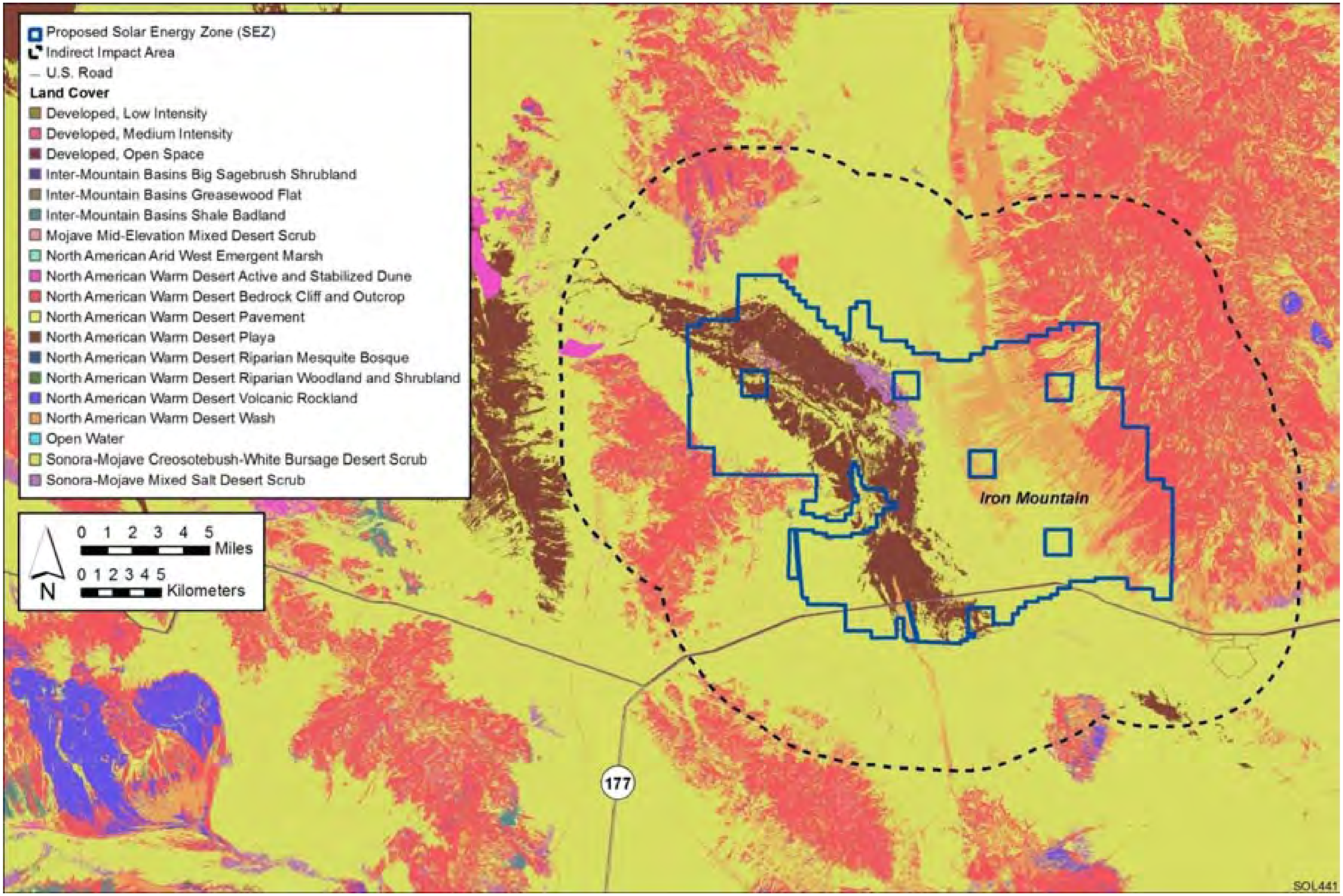

FIGURE 9.2.10.1-1 Land Cover Types within the Proposed Iron Mountain SEZ (Source: NatureServe 2009)

TABLE 9.2.10.1-1 Land Cover Types within the Potentially Affected Area of the Proposed Iron Mountain SEZ and Potential Impacts

Land Cover Type[a]	Area of Cover Type Affected (acres)[b]: Within SEZ[c] (Direct Effects)	Area of Cover Type Affected (acres)[b]: Outside SEZ[d] (Indirect Effects)	Overall Impact Magnitude[e]
5264 Sonora-Mojave Creosotebush-White Bursage Desert Scrub: Occurs in broad valleys, lower bajadas, plains, and low hills in the Mojave and Sonoran deserts. Shrubs form a sparse to moderately dense cover (2 to 50%), although the ground surface may be mostly barren. The dominant species are typically creosotebush (*Larrea tridentata*) and white bursage (*Ambrosia dumosa*). Other shrubs, dwarf-shrubs, and cacti may also be dominant or form sparse understories. Herbaceous species are typically sparse, but may be seasonally abundant.	58,552 acres[f] (2.4%, 3.2%)	156,519 acres (6.4%)	Moderate
3161 North American Warm Desert Playa: Consists of barren and sparsely vegetated areas (generally <10% plant cover) that are intermittently flooded; salt crusts are common. Sparse shrubs occur around the margins, and patches of grass may form in depressions. In large playas, vegetation forms rings in response to salinity. Herbaceous species may be periodically abundant.	22,056 acres (17.9%, 21.1%)	4,422 acres (3.6%)	Large
9151 North American Warm Desert Wash: Consists of intermittently flooded linear or braided strips within desert scrub or grassland landscapes on bajadas, mesas, plains, and basin floors. Although often dry, washes are associated with rapid sheet and gully flow. The vegetation varies from sparse and patchy to moderately dense and typically occurs along the banks, but may occur within the channel. Shrubs and small trees are typically intermittent to open. Common upland shrubs often occur along the edges.	13,490 acres (3.4%, 4.4%)	11,703 acres (3.0%)	Moderate
3120 North American Warm Desert Bedrock Cliff and Outcrop: Occurs on subalpine to foothill steep cliff faces, narrow canyons, rock outcrops, unstable scree and talus slopes. Consists of barren and sparsely vegetated areas (generally <10% plant cover) with desert species, especially succulents. Lichens are predominant in some areas.	9,691 acres (0.8%, 1.0%)	73,420 acres (6.2%)	Small
5265 Sonora-Mojave Mixed Salt Desert Scrub: Extensive open-canopied shrublands in the Mojave and Sonoran deserts, usually occurring around playas and in valley bottoms or basins with saline soils. Vegetation is typically composed of one or more *Atriplex* species; other salt-tolerant plants are often present or even codominant. Grasses occur at varying densities.	1,539 acres (3.4%, 5.1%)	727 acres (1.6%)	Moderate

TABLE 9.2.10.1-1 (Cont.)

Land Cover Type[a]	Area of Cover Type Affected (acres)[b] Within SEZ[c] (Direct Effects)	Outside SEZ[d] (Indirect Effects)	Overall Impact Magnitude[e]
3143 North American Warm Desert Pavement: Consists of unvegetated to very sparsely vegetated (<2% plant cover) areas, usually in flat basins, with ground surfaces of fine to medium gravel coated with "desert varnish." Desert scrub species are usually present. Herbaceous species may be abundant in response to seasonal precipitation.	503 acres (1.4%, 2.0%	1,393 acres (3.8%)	Moderate
21, 22 Developed, Open Space—Low Intensity: Includes housing, parks, golf courses, and other areas planted in developed settings. Impervious surfaces compose up to 49% of the total land cover.	427 acres (1.3%, 3.2%)	923 acres (2.8%)	Moderate
3121 North American Warm Desert Active and Stabilized Dune: Consists of unvegetated to sparsely vegetated (generally <10% plant cover) active dunes and sandsheets. Vegetation includes shrubs, forbs, and grasses. Includes unvegetated "blowouts" and stabilized areas.	209 acres (0.3%, 0.4%)	695 acres (1.1%)	Small
3180 North American Warm Desert Volcanic Rockland: Consists of barren and sparsely vegetated (<10% plant cover) areas. Vegetation is variable and typically includes scattered desert shrubs.	35 acres (<0.1%, <0.1%)	1,109 acres (0.3%)	Small
3139 Inter-Mountain Basins Shale Badland: Typically occurs on rounded hills and plains. Consists of barren and sparsely vegetated areas (<10% plant cover) with high rate of erosion and deposition. Vegetation consists of sparse dwarf shrubs and herbaceous plants.	26 acres (0.1%, 0.3%)	81 acres (0.4%)	Small
11 Open Water: Plant or soil cover is generally less than 25%.	2 acres (<0.1%, <0.1%)	7 acres (<0.1%)	Small
9182 North American Warm Desert Riparian Woodland and Shrubland: Occurs along medium to large perennial streams in canyons and desert valleys. Consists of a mix of riparian woodlands and shrublands. Vegetation is dependent upon annual or periodic flooding, along with substrate scouring, and/or a seasonally shallow water table.	<1 acre (<0.1%, <0.1%)	72 acres (0.8%)	Small

TABLE 9.2.10.1-1 (Cont.)

	Area of Cover Type Affected (acres)[b]		
Land Cover Type[a]	Within SEZ[c] (Direct Effects)	Outside SEZ[d] (Indirect Effects)	Overall Impact Magnitude[e]
5259 Mojave Mid-Elevation Mixed Desert Scrub: The vegetation composition is quite variable. Dominant species include shrubs forbs, and grasses and may include *Yucca* spp.	0 acres	85 acres (0.3%)	Small
Developed, Medium-High Density: Includes housing and commercial/industrial development. Impervious surfaces compose 50–100% of the total land cover.	0 acres	7 acres (<0.1%)	Small

[a] Land cover descriptions are from NatureServe (2009). Full descriptions of land cover types, including plant species, can be found in Appendix I.

[b] Area in acres, determined from Sanborn Mapping (2008).

[c] Includes the area of the cover type within the SEZ, the percentage that area represents of all occurrences of that cover type within the SEZ region (i.e., a 50-mi [80-km] radius from the center of the SEZ), and the percentage that area represents of all occurrences of that cover type on BLM lands within the SEZ region. The SEZ region intersects portions of California and Arizona. However, the SEZ and affected area occur only in California.

[d] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary where ground-disturbing activities would not occur. Indirect effects include effects from surface runoff, dust, and other factors from project facilities. The potential degree of indirect effects would decrease with increasing distance from the SEZ. Includes the area of the cover type within the indirect effects area and the percentage that area represents of all occurrences of that cover type within the SEZ region.

[e] Overall impact magnitude categories were based on professional judgment and include (1) *small*: a relatively small proportion ($\leq$1%) of the cover type within the SEZ region would be lost; (2) *moderate*: an intermediate proportion (>1 but $\leq$10%) of a cover type would be lost; (3) *large*: >10% of a cover type would be lost.

[f] To convert acres to km^2, multiply by 0.004047.

TABLE 9.2.10.1-2 Problem Weeds of the Mojave Weed Management Area

Common Name	Scientific Name
Tamarisk	*Tamarix ramosissima*
Halogeton	*Halogeton glomeratus*
White horsenettle	*Solanum elaeagnifolium*
Yellow starthistle	*Centaurea solstitialis*
Dalmatian toadflax	*Linaria dalmatica*
Russian thistle	*Salsola tragus*
Puncture vine	*Tribulus terrestris*
Camelthorn	*Alhagi maurorum*
Giant reed	*Arundo donax*
Sahara mustard	*Brassica tournefortii*
Red brome	*Bromus madritensis* ssp. *rubens*
Fountain grass	*Pennisetum setaceum*
Tree of heaven	*Ailanthus altissima*
Perennial peppercress[a]	*Lepidium latifolium*
Spanish broom[a]	*Spartium junceum*

[a] Additional species identified in MWMA (2008).

Source: MWMA (2002).

9.2.10.2 Impacts

The construction of solar energy facilities within the Iron Mountain SEZ would result in direct impacts on plant communities because of the removal of vegetation within the facility footprint during land-clearing and land-grading operations. Approximately 80% (85,217 acres [344.9 km^2]) of the SEZ would be expected to be cleared with full development of the SEZ. The plant communities affected would depend on facility locations, and could include any of the communities occurring on the SEZ. Therefore, for the purposes of this analysis, all the area of each cover type within the SEZ is considered to be directly affected by removal with full development of the SEZ.

Indirect effects (caused, for example, by surface runoff or dust from the SEZ) have the potential to degrade affected plant communities and may reduce biodiversity by promoting the decline or elimination of species sensitive to disturbance. Indirect effects can also cause an increase in disturbance-tolerant species or invasive species. High impact levels could result in the elimination of a community or the replacement of one community type for another. The proper implementation of programmatic design features, however, would reduce indirect effects to a minor or small level of impact.

Possible impacts from solar energy facilities on vegetation that are encountered within the SEZ are described in more detail in Section 5.10.1. Any such impacts will be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and from any additional mitigations applied. SEZ-specific design features are described in Section 9.2.10.3.

9.2.10.2.1 Impacts on Native Species

The impacts of construction, operation, and decommissioning were considered small if the impact affected a relatively small proportion (<1%) of the cover type in the SEZ region (within 50 mi [80 km] of the center of the SEZ); a moderate impact (>1 but <10%) could affect an intermediate proportion of cover type; a large impact could affect greater than 10% of a cover type.

Solar facility construction and operation would primarily affect communities of the Sonora–Mojave Creosotebush–White Bursage Desert Scrub, North American Warm Desert Playa, North American Warm Desert Wash, North American Warm Desert Bedrock Cliff and Outcrop cover types. Additional cover types within the SEZ that would be affected include Sonora-Mojave Mixed Salt Desert Scrub, North American Warm Desert Pavement, North American Warm Desert Active and Stabilized Dune, North American Warm Desert Volcanic Rockland, Inter-Mountain Basins Shale Badland, Open Water, North American Warm Desert Riparian Woodland and Shrubland, Mojave Mid-Elevation Mixed Desert Scrub, Developed, Open Space—Low Intensity. The open water areas are likely artificial impoundments, while the developed areas likely support few native plant communities. The potential impacts on native species cover types resulting from solar energy facilities in the proposed Iron Mountain SEZ are summarized in Table 9.2.10.1-1. Many of these cover types are relatively common in the SEZ region; however, several are relatively uncommon, representing less than 1% of the land area within the SEZ region: Inter-Mountain Basins Shale Badland (0.4%), North American Warm Desert Pavement (0.7%), Sonora-Mojave Mixed Salt Desert Scrub (0.9%), and North American Warm Desert Riparian Woodland and Shrubland (0.2%). Sand dune, playa, chenopod scrub/mixed salt desert scrub (primarily associated with Danby Lake), riparian, and dry wash communities are important sensitive habitats in the region.

The construction, operation, and decommissioning of solar projects within the SEZ would result in large impacts on North American Warm Desert Playa. Much of this cover type is associated with Danby Lake; however, solar project development in that area is unlikely (see Section 2.2.2). Solar project development within the SEZ would result in moderate impacts on Sonora-Mojave Creosotebush-White Bursage Desert Scrub, North American Warm Desert Wash, Sonora-Mojave Mixed Salt Desert Scrub, North American Warm Desert Pavement, and Developed, Open Space—Low Intensity, and small impacts on the remaining cover types in the affected area.

Disturbance of vegetation in dune communities within the SEZ, such as from heavy equipment operation, could result in the loss of substrate stabilization. Reestablishment of dune species could be difficult due to the arid conditions and unstable substrates. Because of the arid conditions, reestablishment of shrub communities in temporarily disturbed areas would likely be very difficult and might require extended periods of time. In addition, noxious weeds could become established in disturbed areas and colonize adjacent undisturbed habitats, thus reducing restoration success and potentially resulting in widespread habitat degradation. Cryptogamic soil crusts occur in many of the shrubland communities in the region and likely occur on the SEZ. Damage to these crusts, by the operation of heavy equipment or other vehicles, can alter important soil characteristics, such as nutrient cycling and availability, and affect plant community characteristics (Lovich and Bainbridge 1999).

Communities associated with playa habitats, riparian habitats, or other intermittently flooded areas within or downgradient from solar projects could be affected by ground-disturbing activities. Site-clearing and -grading could disrupt surface water or groundwater flow patterns, resulting in changes in the frequency, duration, depth, or extent of inundation or soil saturation; could potentially alter playa or riparian plant communities, including occurrences outside of the SEZ; and could affect community function. Increases in surface runoff from a solar energy project site could also affect hydrologic characteristics of these communities. The introduction of contaminants into these habitats could result from spills of fuels or other materials used on a project site. Soil disturbance could result in sedimentation in these areas, which could degrade or eliminate sensitive plant communities. Grading could also affect dry washes within the SEZ, and alteration of surface drainage patterns or hydrology could adversely affect downstream dry wash communities. Vegetation within these communities could be lost by erosion or desiccation. See Section 9.2.9 for further discussion of impacts on washes.

Although the use of groundwater within the Iron Mountain SEZ for technologies with high water requirements, such as wet-cooling systems, is considered unlikely, groundwater withdrawals for such systems could reduce groundwater discharge along riparian areas. Communities that depend on accessible groundwater, such as mesquite bosque communities, could become degraded or lost as a result of lowered groundwater levels.

The deposition of fugitive dust from disturbed soil areas in habitats outside a solar project area could result in reduced productivity or changes in plant community composition. Fugitive dust deposition could affect plant communities of each of the cover types occurring within the indirect impact area identified in Table 9.2.10.1-1.

9.2.10.2.2 Impacts from Noxious Weeds and Invasive Plant Species

On February 8, 1999, the President signed E.O. 13112, “Invasive Species,” which directs federal agencies to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts of invasive species (*Federal Register*, Volume 64, page 61836, Feb. 8, 1999). Potential impacts of noxious weeds and invasive plant species resulting from solar energy facilities are described in Section 5.10.1. Despite required programmatic design features to prevent the spread of noxious weeds, project disturbance could potentially increase the prevalence of noxious weeds and invasive species in the affected area of the proposed Iron Mountain SEZ, and increase the probability that weeds could be transported into areas that were previously relatively weed-free. This could result in reduced restoration success and possible widespread habitat degradation.

Noxious weeds, including tamarisk, occur on the SEZ. Species that are known to occur in the BLM Needles Field Office include cheatgrass and Sahara mustard. Additional species known to occur in the Mojave Weed Management Area are given in Table 9.2.10.1-2.

Past or present land uses may affect the susceptibility of plant communities to the establishment of noxious weeds and invasive species. Small areas of Developed, Open Space–Low Intensity, totaling about 427 acres (1.7 km^2), occur within the SEZ, and approximately 923 acres (14.6 km^2) occur within the area of indirect effects. Because disturbance may promote the establishment and spread of invasive species, developed areas may provide sources of such species. Disturbance associated with existing roads, transmission lines, rail lines, and recreational OHV use within the SEZ area of potential impacts also likely contributes to the susceptibility of plant communities to the establishment and spread of noxious weeds and invasive species.

9.2.10.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A, Section A.2.2, would reduce the potential for impacts on plant communities. While some SEZ-specific design features are best established when project details are considered, design features that can be identified at this time include the following:

- An Integrated Vegetation Management Plan, addressing invasive species control, and an Ecological Resources Mitigation and Monitoring Plan, addressing habitat restoration, should be approved and implemented to increase the potential for successful restoration of affected Sonoran Desert habitats and minimize the potential for the spread of invasive species, such as tamarisk, cheatgrass, and sahara mustard. Invasive species control should focus on biological and mechanical methods where possible to reduce the use of herbicides.

- All riparian, playa, chenopod scrub, sand dune, and sand transport areas and desert dry wash habitats should be avoided to the extent practicable, and any impacts on them should be minimized and mitigated. A buffer area should be maintained around riparian areas, playas, and dry washes to reduce the potential for impacts on these habitats on or near the SEZ. Appropriate engineering controls should be used to minimize impacts on these areas resulting from surface-water runoff, erosion, sedimentation, altered hydrology, accidental spills, or fugitive dust deposition to these habitats. Appropriate buffers and engineering controls would be determined through agency consultation.

- Groundwater withdrawals should be limited to reduce the potential for indirect impacts on riparian habitat associated with groundwater discharge or groundwater-dependent communities, such as mesquite bosque.

If these SEZ-specific design features are implemented in addition to programmatic design features, it is anticipated that a high potential for impacts from invasive species and impacts on riparian habitat, dunes, and desert dry washes would be reduced to a minimal potential for impact.

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9.2.11 Wildlife and Aquatic Biota

This section addresses wildlife (amphibians, reptiles, birds, and mammals) and aquatic biota that could occur within the potentially affected area of the proposed Iron Mountain SEZ. Wildlife known to occur within 50 mi (80 km) of the SEZ (i.e., the SEZ region) were determined from the California Wildlife Habitat Relationships System (CDFG 2008). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005, 2007). The amount of aquatic habitat within the SEZ region was determined by estimating the length of linear perennial stream and canal features and the area of standing water body features (i.e., ponds, lakes, and reservoirs) within 50 mi (80 km) of the SEZ using available GIS surface water datasets.

The affected area considered in this assessment included the areas of direct and indirect effects. The area of direct effects was defined as the area that would be physically modified during project development (i.e., where ground-disturbing activities would occur within the SEZ). The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary where ground-disturbing activities would not occur but that could be indirectly affected by activities in the area of direct effect (e.g., surface runoff, dust, noise, lighting, and accidental spills from the SEZ). The potential degree of indirect effects would decrease with increasing distance away from the SEZ. This area of indirect effect was identified on the basis of professional judgment and was considered sufficiently large to bound the area that would potentially be subject to indirect effects.

The affected area is the area bounded by the areas of direct and indirect effects. These areas are defined and the impact assessment approach is described in Appendix M. Because of the proximity of existing infrastructure, the impacts of construction and operation of transmission lines outside of the SEZ are not assessed, assuming that the existing transmission might be used to connect some new solar facilities to load centers and that additional project-specific analysis would be conducted for new transmission construction or line upgrades. Similarly, the impacts of construction of or upgrades to access roads were not assessed for this SEZ because of the proximity of the existing state highway (see Section 9.2.1.2 for a discussion of development assumptions for this SEZ).

Dominant vegetation in the affected area is desert scrub, and the primary land cover habitat type within the affected area is Sonoran-Mojave creosotebush-white bursage desert scrub (see Section 9.2.10). Aquatic and riparian habitats in the affected area occur within and along Danby Lake, intermittent desert washes, and the CRA operated by the MWD (see Section 9.2.9; Figure 9.2.9.1-1). Other potentially unique habitats in the affected area in which wildlife species may reside include desert dunes and rocky slopes, cliffs, and outcrops.

9.2.11.1 Amphibians and Reptiles

9.2.11.1.1 Affected Environment

This section addresses amphibian and reptile species that are known to occur, or for which potentially suitable habitat occurs, on or within the potentially affected area of the proposed Iron Mountain SEZ. The list of amphibian and reptile species potentially present in the project area was determined from range maps and habitat information available from the California Wildlife Habitat Relationships System (CDFG 2008). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005, 2007). See Appendix M for additional information on the approach used.

Based on the range, habitat preferences, and/or presence of suitable land cover for the amphibian species that occur within southeastern California (CDFG 2008; USGS 2004, 2005, 2007), the red-spotted toad (*Bufo punctatus*) would be expected to occur within the proposed Iron Mountain SEZ. However, as it prefers dry, rocky areas near temporary sources of standing water, its occurrence within the SEZ would be spatially limited. Danby Lake could provide suitable habitat for the species. Several other amphibian species could inhabit the CRA, immediately south and southwest of the SEZ: the bullfrog (*Rana catesbeiana*), Colorado River toad (*Bufo alvarius*), Rio Grande leopard frog (*Rana berlandieri*), and Woodhouse's toad (*Bufo woodhousii*). Because these species tend to occur within 300 ft (100 m) of permanent water (USGS 2007), they would not be expected to occur within the SEZ.

Thirty-one reptile species could occur within the proposed Iron Mountain SEZ (CDFG 2008). These species include 1 tortoise, 13 lizards, and 17 snakes. Even though it is a federally and state-listed threatened species, the desert tortoise (*Gopherus agassizii*) is relatively common throughout the area of the SEZ. This species is discussed in Section 9.2.12. Among the more common lizard species that could occur within the SEZ are the desert horned lizard (*Phrynosoma platyrhinos*), long-nosed leopard lizard (*Gambelia wislizenii*), Mojave fringe-toed lizard (*Uma scoparia*), side-blotched lizard (*Uta stansburiana*), western banded gecko (*Coleonyx variegatus*), and zebra-tailed lizard (*Callisaurus draconoides*).

The most common snake species expected to occur within the proposed Iron Mountain SEZ are the coachwhip (*Masticophis flagellum*), glossy snake (*Arizona elegans*), gophersnake (*Pituophis catenifer*), groundsnake (*Sonora semiannulata*), and long-nosed snake (*Rhinocheilus lecontei*). The Mojave rattlesnake (*Crotalus scutulatus*) and sidewinder (*C. cerastes*) would be the most common poisonous snake species expected to occur on the SEZ.

Table 9.2.11.1-1 provides habitat information for representative amphibian and reptile species that could occur within the proposed Iron Mountain SEZ.

TABLE 9.2.11.1-1 Representative Amphibians and Reptiles That Could Occur on or in the Affected Area of the Proposed Iron Mountain SEZ and Potential Impacts

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a]		Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
		Within SEZ (Direct Effects)[b]	Outside SEZ (Indirect Effects)[c]	
Amphibians				
Red-spotted toad (*Bufo punctatus*)	Rocky canyons and gullies in deserts, grasslands, and dry woodlands. When inactive, it occurs under rocks, in rock crevices, or underground. Often found near rocky areas associated with spring seepages, intermittent streams, and cattle tanks. Breeds in shallow water of temporary rain pools, spring-fed pools, and pools along intermittent streams. About 2,626,400 acres[f] of potentially suitable habitat occurs in the SEZ region.	60,091 acres of potentially suitable habitat lost (2.3% of available potentially suitable habitat)	157,331 acres of potentially suitable habitat (6.0% of available potentially suitable habitat)	Moderate. Minimize development within Danby Lake.
Lizards				
Desert horned lizard (*Phrynosoma platyrhinos*)	Deserts dominated by sagebrush, creosotebush, greasewood, or cactus. Occurs on sandy flats, alluvial fans, washes, and edge of dunes. Burrows in soil during periods of inactivity. Common throughout Mojave and Colorado Deserts. About 4,786,300 acres of potentially suitable habitat occurs in the SEZ region.	85,217 acres of potentially suitable habitat lost (1.8% of available potentially suitable habitat)	250,226 acres of potentially suitable habitat (5.2% of available potentially suitable habitat)	Moderate. Avoid development in Homer Wash. No other species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Long-nosed leopard lizard (*Gambelia wislizenii*)	Desert and semidesert areas with scattered shrubs. Prefers sandy or gravelly flats and plains. Also prefers areas with abundant rodent burrows that they occupy when inactive. Widely distributed in the Mojave, Colorado, and other desert areas in California. About 2,626,700 acres of potentially suitable habitat occurs in the SEZ region.	60,091 acres of potentially suitable habitat lost (2.3% of available potentially suitable habitat)	157,331 acres of potentially suitable habitat (6.0% of available potentially suitable habitat)	Moderate.

TABLE 9.2.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a] Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a] Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Lizards (Cont.)				
Mojave fringe-toed lizard (*Uma scoparia*)	Restricted to sparsely vegetated windblown sand of dunes, flats, riverbanks, and washes. Requires fine, loose sand for burrowing. About 2,525,700 acres of potentially suitable habitat occurs in the SEZ region.	58,761 acres of potentially suitable habitat lost (2.3% of available potentially suitable habitat)	157,214 acres of potentially suitable habitat (6.2% of available potentially suitable habitat)	Moderate. Avoid development in Homer Wash.
Side-blotched lizard (*Uta stansburiana*)	Arid and semi-arid locations with scattered bushes or scrubby trees. Often occurs in sandy washes with scattered rocks and bushes. About 4,160,300 acres of potentially suitable habitat occurs in the SEZ region.	81,733 acres of potentially suitable habitat lost (2.0% of available potentially suitable habitat)	241,727 acres of potentially suitable habitat (5.8% of available potentially suitable habitat)	Moderate. Avoid development in Homer Wash.
Western banded gecko (*Coleonyx variegatus*)	Wide variety of habitats, including deserts with creosotebush and sagebrush and pinyon-juniper woodlands. Inhabits both rocky areas and barren dunes. Most abundant in sandy flats and desert washes. Uses rocks, burrows, and spaces beneath vegetative debris or trash during period of inactivity. About 3,156,300 acres of potentially suitable habitat occurs in the SEZ region.	85,217 acres of potentially suitable habitat lost (2.7% of available potentially suitable habitat)	173,528 acres of potentially suitable habitat (5.5% of available potentially suitable habitat)	Moderate. Avoid development in Homer Wash. No other species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 9.2.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a] Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a] Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Lizards (Cont.)				
Zebra-tailed lizard (*Callisaurus draconoides*)	Sparsely vegetated deserts on open sandy washes, dunes, floodplains, beaches, or desert pavement. Common and widely distributed throughout Mojave and Colorado Deserts. About 3,578,200 acres of potentially suitable habitat occurs in the SEZ region.	85,217 acres of potentially suitable habitat lost (2.4% of available potentially suitable habitat)	176,725 acres of potentially suitable habitat (4.9% of available potentially suitable habitat)	Moderate. Avoid development in Homer Wash. No other species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Snakes				
Coachwhip (*Masticophis flagellum*)	Wide variety of open terrain habitats. Most abundant in deserts, grasslands, scrub, chaparral, and pastures. Prefers relatively dry open terrain. It seeks cover in burrows, rocks, or vegetation. About 3,801,800 acres of potentially suitable habitat occurs in the SEZ region.	68,452 acres of potentially suitable habitat lost (1.8% of available potentially suitable habitat)	230,634 acres of potentially suitable habitat (6.1% of available potentially suitable habitat)	Moderate.
Glossy snake (*Arizona elegans*)	Variety of habitats, including barren to sparsely shrubby deserts, sagebrush flats, grasslands, and sandhills. Prefers sandy areas with scattered brush, but also occurs in rocky areas. Shelters and lays eggs underground. Common throughout southern California, particularly the desert regions. About 5,034,700 acres of potentially suitable habitat occurs in the SEZ region.	85,217 acres of potentially suitable habitat lost (1.7% of available potentially suitable habitat)	251,163 acres of potentially suitable habitat (5.0% of available potentially suitable habitat)	Moderate. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 9.2.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Snakes (Cont.)				
Gophersnake (*Pituophis catenifer*)	Wide variety of habitats, including deserts, prairies, shrublands, woodlands, and farmlands. May dig its burrow or occupy mammal burrows. Eggs are laid in burrows or under large rocks or logs. Most widespread and common snake in California. About 3,368,100 acres of potentially suitable habitat occurs in the SEZ region.	85,217 acres of potentially suitable habitat lost (2.5% of available potentially suitable habitat)	175,153 acres of potentially suitable habitat (5.2% of available potentially suitable habitat)	Moderate. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Groundsnake (*Sonora semiannulata*)	Arid and semi-arid areas, including desert flats, sand hummocks, rocky hillsides with pockets of loose soil. Ranges from prairie and desert lowlands to pinyon-juniper and oak-pine zone. About 3,009,900 acres of potentially suitable habitat occurs in the SEZ region.	72,251 acres of potentially suitable habitat lost (2.4% of available potentially suitable habitat)	168,917 acres of potentially suitable habitat (5.6% of available potentially suitable habitat)	Moderate. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Long-nosed snake (*Rhinocheilus lecontei*)	Typically inhabits deserts, dry prairies and river valleys. Occurs by day and lays eggs underground or under rocks. Burrows rapidly in loose soil. Common in desert regions. About 554,600 acres of potentially suitable habitat occurs in the SEZ region.	13,699 acres of potentially suitable habitat lost (2.4% of available potentially suitable habitat)	12,470 acres of potentially suitable habitat (2.2% of available potentially suitable habitat)	Moderate.

TABLE 9.2.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a] Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a] Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Snakes (Cont.)				
Mojave rattlesnake (*Crotalus scutulatus*)	Mostly upland desert and lower mountain slopes including barren desert, grasslands, open woodland, and scrubland. Generally avoids broken rocky terrain or densely vegetated areas. Takes refuge in animal burrows or spaces under or among rocks. Widely distributed throughout the Mojave and extreme northern Colorado Deserts. About 2,595,600 acres of potentially suitable habitat occurs in the SEZ region.	58,552 acres of potentially suitable habitat lost (2.3% of available potentially suitable habitat)	156,676 acres of potentially suitable habitat (6.0% of available potentially suitable habitat)	Moderate.
Sidewinder (*Crotalus. cerastes*)	Open desert terrain with fine windblown sand, desert flats with sandy washes, or sparsely vegetated sand dunes. Concentrates near washes and areas of relatively dense vegetation where mammal burrows are common. During periods of inactivity, uses underground burrows, occurs under bushes, or almost completely snuggles under sand. Widely distributed and locally abundant in the Mojave and Colorado Deserts. About 2,650,500 acres of potentially suitable habitat occurs in the SEZ region.	58,761 acres of potentially suitable habitat lost (2.2% of available potentially suitable habitat)	157,371 acres of potentially suitable habitat (5.9% of available potentially suitable habitat)	Moderate. Avoid development in Homer Wash.

a Maximum area of potentially suitable habitat affected relative to total available potentially suitable habitat within the SEZ region (i.e., a 50-mi [80-km] radius from the center of the SEZ). Habitat availability was determined from potentially suitable land cover for each species (USGS 2004, 2005, 2007).

b Direct effects within the SEZ consist of ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations. A maximum of 85,217 acres (345 km^2) would be developed in the SEZ.

c The area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary. Indirect effects include effects from surface runoff, dust, noise, lighting, etc., from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance away from the SEZ boundary.

Footnotes continued on next page.

TABLE 9.2.11.1-1 (Cont.)

[d] Overall impact magnitude categories were based on professional judgment and include (1) *small*: ≤1% of potentially suitable habitat for the species would be lost, and the activity would not result in a measurable change in the carrying capacity or population size in the affected area; (2) *moderate*: >1 but ≤10% of potentially suitable habitat for the species would be lost and the activity would potentially result in a measurable but moderate (not destabilizing) change in the carrying capacity or population size in the affected area; and (3) *large*: >10% of potentially suitable habitat for the species would be lost and the activity would result in a potentially large, measurable, and destabilizing change in the carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects because those effects would be difficult to mitigate. Programmatic design features would reduce most indirect effects to negligible levels.

[e] Species-specific mitigation is presented for those species that have particular habitat features that could be readily avoided. For species or individuals occurring outside the SEZ (in the area of indirect effects), no mitigation measures beyond required programmatic design features have been identified.

[f] To convert acres to km^2, multiply by 0.004047.

Sources: CDFG (2008); NatureServe (2010); USGS (2004, 2005, 2007).

9.2.11.1.2 Impacts

The potential for impacts on amphibians and reptiles from utility-scale solar energy development within the proposed Iron Mountain SEZ is presented in this section. The types of impacts that amphibians and reptiles could incur from construction, operation, and decommissioning of utility-scale solar energy facilities are discussed in Section 5.10.2.1. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and application of any additional mitigation. Section 9.2.11.1.3, below, identifies SEZ-specific design features of particular relevance to the proposed Iron Mountain SEZ.

The assessment of impacts on amphibians and reptile species is based on available information on the presence of species in the affected area, as presented in Section 9.2.11.1.1, following the analysis approach described in Appendix M. Additional NEPA assessments and coordination with state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid or mitigate impacts on amphibians and reptiles (see Section 9.2.11.1.3).

In general, impacts on amphibians and reptiles would result from habitat disturbance (i.e., habitat reduction, fragmentation, and alteration) and from disturbance, injury, or mortality to individual amphibians and reptiles. On the basis of the impacts on amphibians and reptiles summarized in Table 9.2.11.1-1, direct impacts on amphibian and reptile species would be moderate, as 1.7 to 2.7% of potentially suitable habitats identified for the species in the SEZ region would be lost. Larger areas of potentially suitable habitats for most amphibian and reptile species occur within the area of potential indirect effects (e.g., up to 6.1% of available habitat for the coachwhip). Other impacts on amphibians and reptiles could result from surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, accidental spills, collection, and harassment. These indirect impacts are expected to be negligible with implementation of programmatic design features.

Decommissioning of facilities and reclamation of disturbed areas after operations cease could result in short-term negative impacts on individuals and habitats adjacent to project areas, but long-term benefits would accrue if suitable habitats were restored in previously disturbed areas. Section 5.10.2.1.4 provides an overview of the impacts of decommissioning and reclamation on wildlife. Of particular importance for amphibian and reptile species would be the restoration of original ground surface contours, soils, and native plant communities associated with semiarid shrublands.

9.2.11.1.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A, Section A.2.2, would reduce the potential for effects on amphibians and reptiles, especially for those species that utilize habitat types that can be avoided (e.g., ephemeral drainages). Indirect impacts could be reduced to negligible levels by implementing programmatic design features, especially those engineering controls that would reduce runoff, sedimentation, spills, and fugitive dust. While SEZ-specific features are best established when project details are considered, the design feature that can be identified at this time includes the following:

- Avoid the CRA, Homer Wash, and portions of Danby Lake.

If this SEZ-specific design feature is implemented in addition to other programmatic design features, impacts on amphibians and reptiles could be reduced. Any residual impacts on amphibians and reptiles are anticipated to be moderate given the relative abundance of potentially suitable habitats in the SEZ region. However, because potentially suitable habitats for a number of the amphibian and reptile species occur throughout much of the SEZ, additional species-specific mitigation of direct effects for those species would be difficult or infeasible.

9.2.11.2 Birds

9.2.11.2.1 Affected Environment

This section addresses bird species that are known to occur, or for which potentially suitable habitat occurs, on or within the potentially affected area of the proposed Iron Mountain SEZ. The list of bird species potentially present in the project area was determined from range maps and habitat information available from the California Wildlife Habitat Relationships System (CDFG 2008). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005, 2007). See Appendix M for additional information on the approach used.

> **Desert Focal Bird Species**
>
> Bird species whose requirements define spatial attributes, habitat characteristics, and management regimes representative of a healthy desert system (Chase and Geupel 2005).

Nearly 100 species of birds have a range that encompasses the proposed Iron Mountain SEZ region. However, potentially suitable habitats for about 40 of these species either do not occur on or are limited within the SEZ (e.g., habitat for waterfowl and wading birds). In addition, the SEZ region is only within the winter range (35 species) or summer range (10 species) of a number of birds. Eleven bird species that may occur within the SEZ are considered focal species for the California Partners in Flight's *Desert Bird Conservation Plan* (CalPIF 2009): ash-throated flycatcher (*Myiarchus cinerascens*), black-tailed gnatcatcher (*Polioptila melanura*), black-throated sparrow (*Amphispiza bilineata*), burrowing owl (*Athene cunicularia*), common raven (*Corvus corax*), Costa's hummingbird (*Calypte costae*), crissal thrasher (*Toxostoma crissale*), ladder-backed woodpecker (*Picoides scalaris*), Le Conte's thrasher (*Toxostoma lecontei*), phainopepla (*Phainopepla nitens*), and verdin (*Auriparus flaviceps*). Habitats for these species are described in Table 9.2.11.2-1. The ash-throated flycatcher would be a summer resident within the SEZ, while the other desert focal bird species could occur year-round (CalPIF 2009).

TABLE 9.2.11.2-1 Representative Bird Species That Could Occur on or in the Affected Area of the Proposed Iron Mountain SEZ and Potential Impacts

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a]		Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
		Within SEZ (Direct Effects)[b]	Outside SEZ (Indirect Effects)[c]	
Shorebirds				
Killdeer (*Charadrius vociferus*)	Widespread throughout California. Open areas such as fields, meadows, lawns, mudflats, and shores. Nests on ground in open dry or gravelly locations. About 299,300 acres[f] of potentially suitable habitat occurs in the SEZ region. Year-round.	22,485 acres of potentially suitable habitat lost (7.5% of available potentially suitable habitat)	5,359 acres of potentially suitable habitat (1.8% of available potentially suitable habitat)	Moderate. Minimize development within Danby Lake. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Least sandpiper (*Calidris minutilla*)	Wet meadows, mudflats, flooded fields, lake shores, edge of salt marshes, and river sandbars. About 40,500 acres of potentially suitable habitat occurs in the SEZ region. Common to abundant in winter.	2 acres of potentially suitable habitat lost (<0.01% of available potentially suitable habitat)	79 acres of potentially suitable habitat (0.2% of available potentially suitable habitat)	Small. Minimize development within Danby Lake. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 9.2.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a] Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a] Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Neotropical Migrants				
Ash-throated flycatcher (*Myiarchus cinerascens*)	Common in scrub and woodland habitats, including desert riparian and desert washes. Requires hole/cavity for nesting. Uses shrubs or small trees for foraging perches. About 3,033,400 acres of potentially suitable habitat occurs in the SEZ region. Summer.	73,581 acres of potentially suitable habitat lost (2.4% of available potentially suitable habitat)	169,106 acres of potentially suitable habitat (5.6% of available potentially suitable habitat)	Moderate. Avoid development in Homer Wash. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Black-tailed gnatcatcher (*Polioptila melanura*)	Nests in bushes mainly in wooded desert washes with dense mesquite, palo verde, ironwood, and acacia. Also occurs in desert scrub habitat. About 3,017,400 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	72,251 acres of potentially suitable habitat lost (2.4% of available potentially suitable habitat)	168,917 acres of potentially suitable habitat (5.6% of available potentially suitable habitat)	Moderate. Avoid development in Homer Wash. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Black-throated sparrow (*Amphispiza bilineata*)	Chaparral and desert scrub habitats with sparse to open stands of shrubs. Often in areas with scattered Joshua trees. Nests in thorny shrubs or cactus. About 3,027,100 acres of potentially suitable habitat occurs in the SEZ region. Year-round	59,325 acres of potentially suitable habitat lost (2.0% of available potentially suitable habitat)	159,882 acres of potentially suitable habitat (5.3% of available potentially suitable habitat)	Moderate. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 9.2.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Neotropical Migrants (Cont.)				
Brewer's sparrow (*Spizella breweri*)	Common in Mojave and Colorado deserts during winter. Occupies open desert scrub and cropland habitats. About 2,558,400 acres of potentially suitable habitat occurs in the SEZ region.	59,081 acres of potentially suitable habitat lost (2.3% of available potentially suitable habitat)	158,150 acres of potentially suitable habitat (6.2% of available potentially suitable habitat)	Moderate. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Cactus wren (*Campylorhynchus brunneicapillus*)	Desert (especially areas with cholla cactus or yucca), mesquite, arid scrub, coastal sage scrub, and trees in towns in arid regions. Nests in *Opuntia* spp.; twiggy, thorny trees and shrubs; and sometimes in buildings. Nests may be used as winter roost. Locally common in the Mojave and Colorado deserts. About 4,169,900 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	81,733 acres of potentially suitable habitat lost (2.0% of available potentially suitable habitat)	241,799 acres of potentially suitable habitat (5.8% of available potentially suitable habitat)	Moderate. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Common poorwill (*Phalaenoptilus nuttallii*)	Scrubby and brushy areas, prairie, desert, rocky canyons, open woodlands, and broken forests. Mostly in arid and semi-arid habitats. Nests in open areas on a bare site. About 4,187,400 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	83,272 acres of potentially suitable habitat lost (2.0% of available potentially suitable habitat)	242,441 acres of potentially suitable habitat (5.8% of available potentially suitable habitat)	Moderate. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 9.2.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a] Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a] Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Neotropical Migrants (Cont.)				
Common raven (*Corvus corax*)	Occurs in most habitats. Trees and cliffs provide cover. Roosts primarily in trees. Nests on cliffs, bluffs, tall trees, or human-made structures. Forages in sparse, open terrain. About 2,793,100 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	60,518 acres of potentially suitable habitat lost (2.2% of available potentially suitable habitat)	158,333 acres of potentially suitable habitat (5.78% of available potentially suitable habitat)	Moderate. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Costa's hummingbird (*Calypte costae*)	Desert and semidesert areas, arid brushy foothills, and chaparral. Main habitats are desert washes, edges of desert riparian and valley foothill riparian areas, coastal shrub, desert scrub, desert succulent shrub, lower-elevation chaparral, and palm oasis. Also in mountains, meadows, and gardens during migration and winter. Most common in canyons and washes when nesting. Nests in trees, shrubs, vines, or cacti. About 3,032,700 acres of potentially suitable habitat occurs in the SEZ region. Common in summer and uncommon in winter in California.	73,581 acres of potentially suitable habitat lost (2.4% of available potentially suitable habitat)	169,106 acres of potentially suitable habitat (5.6% of available potentially suitable habitat)	Moderate. Avoid development in Homer Wash. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 9.2.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Neotropical Migrants (Cont.)				
Greater roadrunner (*Geococcyx californianus*)	Desert scrub, chaparral, edges of cultivated lands, and arid open areas with scattered brush. Requires thickets, large bushes, or small trees for shade, refuge, and roosting. Usually nests low in trees, shrubs, or clumps of cactus. Rarely nests on ground. About 4,534,000 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	85,217 acres of potentially suitable habitat lost (1.9% of available potentially suitable habitat)	248,575 acres of potentially suitable habitat (5.5% of available potentially suitable habitat)	Moderate. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Horned lark (*Eremophila alpestris*)	Common to abundant resident in a variety of open habitats. Breeds in grasslands, sagebrush, semidesert shrublands, and alpine tundra. During migration and winter, inhabits the same habitats other than tundra, and occurs in agricultural areas. Usually occurs where plant density is low and there are exposed soils. About 2,625,400 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	60,091 acres of potentially suitable habitat lost (2.3% of available potentially suitable habitat)	157,331 acres of potentially suitable habitat (6.0% of available potentially suitable habitat)	Moderate. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 9.2.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Neotropical Migrants (Cont.)				
House finch (*Carpodacus mexicanus*)	Variety of areas, including arid scrub and brush, desert riparian areas, open woodlands, cultivated lands, and savannas. Usually forages in areas with elevated escape perches (e.g., trees, tall shrubs, transmission lines, and buildings). Roosts and nests in sheltered sites in trees; tall, dense shrubs; man-made structures; cliff crevices; or earthen banks. About 165,000 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	427 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	1,002 acres of potentially suitable habitat (0.6% of available potentially suitable habitat)	Small. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Ladder-backed woodpecker (*Picoides scalaris*)	Fairly common in Mojave and Colorado Deserts. Variety of habitats including deserts, arid scrub, riparian woodlands, mesquite, scrub oak, pinyon-juniper woodlands. Digs nest hole in rotted stub or dead or dying branches of various trees. Also nests in saguaro, agave, yucca, fence posts, and utility poles. Nests on ledges; branches of trees, shrubs, and cactus; and holes in trees or walls. About 2,641,688 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	60,091 acres of potentially suitable habitat lost (2.2% of available potentially suitable habitat)	157,403 acres of potentially suitable habitat (6.0% of available potentially suitable habitat)	Moderate. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 9.2.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Neotropical Migrants (Cont.)				
Le Conte's thrasher (*Toxostoma leconteii*)	Open desert wash, alkali desert scrub, and desert succulent shrub habitats. Prefers to nest and forage in arroyos and washes lined with dense stands of creosotebush and salt bush. About 3,038,200 acres of potentially suitable habitat occurs in the SEZ region. Year-round, but uncommon to rare.	72,251 acres of potentially suitable habitat lost (2.4% of available potentially suitable habitat)	169,002 acres of potentially suitable habitat (5.6% of available potentially suitable habitat)	Moderate. Avoid development in Homer Wash. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Lesser nighthawk (*Chordeiles acutipennis*)	Open country, desert regions, scrub, savanna, and cultivated areas. Usually near water including open marshes, salt ponds, large rivers, rice paddies, and beaches. Roosts on low perches or the ground. Nests in the open on bare sites. About 4,653,600 acres of potentially suitable habitat occurs in the SEZ region. Uncommon summer resident.	84,045 acres of potentially suitable habitat lost (1.8% of available potentially suitable habitat)	245,732 acres of potentially suitable habitat (5.3% of available potentially suitable habitat)	Moderate. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 9.2.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Neotropical Migrants (Cont.)				
Loggerhead shrike (*Lanius ludovicianus*)	Open country with scattered trees and shrubs, savanna, desert scrub, desert riparian, Joshua tree, and occasionally, open woodland habitats. Perches on poles, wires, or fence posts (suitable hunting perches are important aspect of habitat). Nests in shrubs and small trees. About 3,159,400 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	74,008 acres of potentially suitable habitat lost (2.3% of available potentially suitable habitat)	170,029 acres of potentially suitable habitat (5.4% of available potentially suitable habitat)	Moderate. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Phainopepla (*Phainopepla nitens*)	Common in Mojave and Colorado deserts. Desert scrub, mesquite, juniper and oak woodlands, tall brush, washes, riparian woodlands, and orchards. Nests in dense foliage of large shrubs or trees, sometimes in a clump of mistletoe. About 676,900 acres of potentially suitable habitat occurs in the SEZ region. Year-round, but many move to more western and northern portions of California during summer.	13,699 acres of potentially suitable habitat lost (2.0% of available potentially suitable habitat)	12,555 acres of potentially suitable habitat (1.9% of available potentially suitable habitat)	Moderate. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Say's phoebe (*Sayornis saya*)	Arid open country, deserts, sagebrush plains, dry barren foothills, canyons, cliffs, ranches, and rural homes. Nests in cliff crevices, holes in banks, sheltered ledges, tree cavities, under bridges and roofs, and in mines. About 3,847,000 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	70,209 acres of potentially suitable habitat lost (1.8% of available potentially suitable habitat)	231,674 acres of potentially suitable habitat (6.0% of available potentially suitable habitat)	Moderate. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 9.2.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Neotropical Migrants (Cont.)				
Verdin (*Auriparus flaviceps*)	Common to abundant in Colorado Desert, less common in Mojave Desert. Desert riparian, desert wash, desert scrub, and alkali desert scrub areas with large shrubs and small trees. Nests in shrubs, small trees, or cactus. About 4,162,260 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	79,455 acres of potentially suitable habitat lost (1.9% of available potentially suitable habitat)	175,446 acres of potentially suitable habitat (4.2% of available potentially suitable habitat)	Moderate. Avoid development in Homer Wash. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
White-throated swift (*Aeronautes saxatalis*)	Mountainous country near cliffs and canyons where breeding occurs. Forages over forest and open situations. Nests in rock crevices and canyons, sometimes in buildings. Ranges widely over most terrain and habitats, usually high in the air. About 434,970 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	17,642 acres of potentially suitable habitat lost (4.1% of available potentially suitable habitat)	20,990 acres of potentially suitable habitat (4.8% of available potentially suitable habitat)	Moderate.
Birds of Prey				
American kestrel (*Falco sparverius*)	Occurs in most open habitats, in various shrub and early successional forest habitats, forest openings, and various ecotones. Perches on trees, snags, rocks, utility poles and wires, and fence posts. Uses cavities in trees, snags, rock areas, banks, and buildings for nesting and cover. About 1,840,900 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	11,692 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat)	76,343 acres of potentially suitable habitat (4.1% of available potentially suitable habitat)	Small.

TABLE 9.2.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Birds of Prey (Cont.)				
Golden eagle (*Aquila chrysaetos*)	Grasslands, shrublands, pinyon-juniper woodlands, and ponderosa pine forests. Occasionally in most other habitats, especially during migration and winter. Nests on cliffs and sometimes trees in rugged areas, with breeding birds ranging widely over surrounding areas. About 4,749,700 acres of potentially suitable habitat occurs in the SEZ region. Winter.	85,217 acres of potentially suitable habitat lost (1.8% of available potentially suitable habitat)	248,057 acres of potentially suitable habitat (5.2% of available potentially suitable habitat)	Moderate. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Bald and Golden Eagle Protection Act.
Prairie falcon (*Falco mexicanus*)	Associated primarily with perennial grasslands, savannahs, rangeland, some agricultural fields, and desert scrub areas. Nests in potholes or well-sheltered ledges on rocky cliffs or steep earth embankments. May also nest in man-made excavations on otherwise unsuitable cliffs and old nests of ravens, hawks, and eagles. Forages in large patch areas with low vegetation. May forage over irrigated croplands in winter. About 4,226,500 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	81,733 acres of potentially suitable habitat lost (1.9% of available potentially suitable habitat)	241,714 acres of potentially suitable habitat (5.7% of available potentially suitable habitat)	Moderate.

TABLE 9.2.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Birds of Prey (Cont.)				
Red-tailed hawk (*Buteo jamaicensis*)	Wide variety of habitats from deserts, mountains, and populated valleys. Open areas with scattered, elevated perch sites such as scrub desert, plains and montane grassland, agricultural fields, pastures urban parklands, broken coniferous forests, and deciduous woodland. Nests on cliff ledges or in tall trees. About 3,836,400 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	69,782 acres of potentially suitable habitat lost (1.8% of available potentially suitable habitat)	230,823 acres of potentially suitable habitat (6.0% of available potentially suitable habitat)	Moderate.
Turkey vulture (*Cathartes aura*)	Occurs in open stages of most habitats that provide adequate cliffs or large trees for nesting, roosting, and resting. Migrates and forages over most open habitats. Will roost communally in trees, exposed boulders, and occasionally transmission line support towers. About 3,727,800 acres of potentially suitable habitat occurs in the SEZ region. Summer.	69,782 acres of potentially suitable habitat lost (1.9% of available potentially suitable habitat)	230,751 acres of potentially suitable habitat (6.2% of available potentially suitable habitat)	Moderate.
Upland Game Birds				
Gambel's quail (*Callipepla gambelii*)	Deserts, especially in areas with brushy or thorny growth, and adjacent cultivated areas. Usually occurs near water. Nests on the ground under cover of small trees, shrubs, and grass tufts. About 4,230,100 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	83,272 acres of potentially suitable habitat lost (2.0% of available potentially suitable habitat)	242,526 acres of potentially suitable habitat (5.7% of available potentially suitable habitat)	Moderate.

TABLE 9.2.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a] Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a] Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Upland Game Birds (Cont.)				
Mourning dove (*Zenaida macroura*)	Habitat generalist, occurring in grasslands, shrublands, croplands, lowland and foothill riparian forests, ponderosa pine forests, deserts, and urban and suburban areas. Rarely in aspen and other forests, coniferous woodlands, and alpine tundra. Nests on ground or in trees. Winters mostly in lowland riparian forests adjacent to cropland. About 3,333,200 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	85,217 acres of potentially suitable habitat lost (2.6% of available potentially suitable habitat)	174,539 acres of potentially suitable habitat (5.2% of available potentially suitable habitat)	Moderate. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

[a] Maximum area of potentially suitable habitat affected relative to total available potentially suitable habitat within the SEZ region (i.e., a 50-mi [80-km] radius from the center of the SEZ). Habitat availability was determined from potentially suitable land cover for each species (USGS 2004, 2005, 2007).

[b] Direct effects within the SEZ consist of ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations. A maximum of 85,217 acres (345 km^2) would be developed in the SEZ.

[c] The area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary. Indirect effects include effects from surface runoff, dust, noise, lighting, etc., from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance away from the SEZ boundary.

[d] Overall impact magnitude categories were based on professional judgment and include (1) *small*: ≤1% of potentially suitable habitat for the species would be lost, and the activity would not result in a measurable change in the carrying capacity or population size in the affected area; (2) *moderate*: >1 but ≤10% of potentially suitable habitat for the species would be lost and the activity would potentially result in a measurable but moderate (not destabilizing) change in the carrying capacity or population size in the affected area; and (3) *large*: >10% of potentially suitable habitat for the species would be lost and the activity would result in a potentially large, measurable, and destabilizing change in the carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects because those effects would be difficult to mitigate. Programmatic design features would reduce most indirect effects to negligible levels.

Footnotes continued on next page.

TABLE 9.2.11.2-1 (Cont.)

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[e] Species-specific mitigation is presented for those species that have particular habitat features that could be readily avoided. For species or individuals occurring outside the SEZ (in the area of indirect effects), no mitigation measures beyond required programmatic design features have been identified.

[f] To convert acres to km^2, multiply by 0.004047.

Sources: CDFG (2008); NatureServe (2010); USGS (2004, 2005, 2007).

Waterfowl, Wading Birds, and Shorebirds

As discussed in Section 4.10.2.2.2, waterfowl (ducks, geese, and swans), wading birds (herons and cranes), and shorebirds (avocets, gulls, plovers, rails, sandpipers, stilts, and terns) are among the most abundant groups of birds in the six-state study area. About 20 waterfowl, wading bird, and shorebird species occur within the proposed Iron Mountain SEZ region. Within the SEZ, waterfowl, wading birds, and shorebirds are uncommon because of the lack of potentially suitable habitats. The killdeer (*Charadrius vociferus*) and least sandpiper (*Calidris minutilla*) (shorebird species) would be expected to occur on the SEZ in the area of Danby Lake. Some waterfowl, wading birds, and shorebirds may also make use of the Colorado River Aqueduct that flows along the southern boundary of the SEZ. The Colorado River, located over 20 mi (32 km) southeast of the SEZ, and the Salton Sea, located over 60 mi (96 km) southwest of the SEZ, would provide more productive habitat for this group of birds.

Neotropical Migrants

As discussed in Section 4.10.2.2.3, neotropical migrants represent the most diverse category of birds within the six-state study area. Neotropical migrants expected to occur within the proposed Iron Mountain SEZ throughout the year include the black-tailed gnatcatcher, black-throated sparrow, cactus wren (*Campylorhynchus brunneicapillus*), common poorwill (*Phalaenoptilus nuttallii*), common raven, Costa's hummingbird, crissal thrasher, greater roadrunner (*Geococcyx californianus*), horned lark (*Eremophila alpestris*), house finch (*Carpodacus mexicanus*), ladder-backed woodpecker, Le Conte's thrasher, loggerhead shrike (*Lanius ludovicianus*), phainopepla, Say's phoebe (*Sayornis saya*), verdin, and white-throated swift (*Aeronautes saxatalis*). The winter range for the Brewer's sparrow (*Spizella breweri*), green-tailed towhee (*Pipilo chlorurus*), and sage sparrow (*Amphispiza belli*) encompasses the SEZ, while the summer range for the ash-throated flycatcher (*Myiarchus cinerascens*) and lesser nighthawk (*Chordeiles acutipennis*) encompasses the SEZ (CDFG 2008).

Birds of Prey

Section 4.10.2.2.4 provides an overview of the birds of prey (raptors, owls, and vultures) within the six-state study area. Seventeen bird-of-prey species have ranges that encompass the proposed Iron Mountain SEZ (CDFG 2008). Raptor species expected to could occur within the SEZ include the American kestrel (*Falco sparverius*, year-round), burrowing owl (year-round), ferruginous hawk (*Buteo regalis*, winter), golden eagle (*Aquila chrysaetos*, winter), prairie falcon (*Falco mexicanus*, year-round), red-tailed hawk (*Buteo jamaicensis*, year-round), and turkey vulture (*Cathartes aura*, summer) (CDFG 2008). However, the American kestrel, golden eagle, prairie falcon, and red-tailed hawk only make infrequent use of the desert region within which the proposed Iron Mountain SEZ occurs. The golden eagle is a Fully Protected species by the State of California (CDFG 2010a).

Upland Game Birds

Section 4.10.2.2.5 provides an overview of the upland game birds (primarily pheasants, grouse, quail, and doves) that occur within the six-state study area. Upland game species that could occur year-round within the proposed Iron Mountain SEZ are Gambel's quail (*Callipepla gambelii*) and mourning dove (*Zenaida macroura*) (CDFG 2008). Gambel's quail is common within the Colorado and Mojave Desert areas of California. It prefers riparian areas and also occurs near streams, springs and water holes. While they feed in open habitats, trees or tall shrubs are required for escape cover. They also require a nearby source of water, particularly during hot summer months (CDFG 2008). Up to 400,000 Gambel's quail are harvested annually in California (CDFG 2008). The mourning dove is common throughout California and can be found in a wide variety of habitats. Regardless of habitat occupied, it requires a nearby water source (CDFG 2008).

Table 9.2.11.2-1 provides habitat information for representative bird species that could occur within the proposed Iron Mountain SEZ. Because of their special status standing, the burrowing owl, crissal thrasher, ferruginous hawk, and short-eared owl are discussed in Section 9.2.12.1.

9.2.11.2.2 Impacts

The types of impacts that birds could incur from construction, operation, and decommissioning of utility-scale solar energy facilities are discussed in Section 5.10.2.1. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through any additional mitigation applied. Section 9.2.11.2.3, below, identifies design features of particular relevance to the proposed Iron Mountain SEZ.

The assessment of impacts on bird species is based on available information on the presence of species in the affected area, as presented in Section 9.2.11.2.1, following the analysis approach described in Appendix M. Additional NEPA assessments and coordination with state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid or mitigate impacts on birds (see Section 9.2.11.2.3).

In general, impacts on birds would result from habitat disturbance (i.e., habitat reduction, fragmentation, and alteration), and from disturbance, injury, or mortality to individual birds. Table 9.2.11.2-1 summarizes the potential impacts on representative bird species resulting from solar energy development in the proposed Iron Mountain SEZ. Direct impacts on bird species would be small for a few species (e.g., least sandpiper, house finch, and American kestrel), as only 0.6% or less of potentially suitable habitats for these species would be lost (Table 9.2.11.2-1). Impacts on the other bird species would be moderate, as solar energy development within the SEZ would impact 1.8 to 7.5% of potentially suitable habitat for these species (Table 9.2.11.2-1). Larger areas of potentially suitable habitat for bird species occur within the area of potential indirect effects (e.g., up to 6.2% of potentially suitable habitat for the

Brewer’s sparrow and turkey vulture). Other impacts on birds could result from collision with vehicles and buildings, surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, noise, lighting, spread of invasive species, accidental spills, and harassment. Indirect impacts on areas outside the SEZ (for example, impacts caused by dust generation, erosion, and sedimentation) are expected to be negligible with implementation of programmatic design features.

Decommissioning of facilities and reclamation of disturbed areas after operations cease could result in short-term negative impacts on individuals and habitats adjacent to project areas, but long-term benefits would accrue if suitable habitats were restored in previously disturbed areas. Section 5.10.2.1.4 provides an overview of the impacts of decommissioning and reclamation on wildlife. Of particular importance for bird species would be the restoration of original ground surface contours, soils, and native plant communities associated with semiarid shrublands.

9.2.11.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

The successful implementation of programmatic design features presented in Appendix A, Section A.2.2, would reduce the potential for effects on birds. Indirect impacts could be reduced to negligible levels by implementing programmatic design features, especially those engineering controls that would reduce runoff, sedimentation, spills, and fugitive dust. While some SEZ-specific design features important to reducing impacts on birds are best established when project details are considered, some design features can be identified at this time, as follows:

- Pre-disturbance surveys should be conducted within the SEZ for bird species listed under the Migratory Bird Treaty Act. Impacts on potential nesting habitat of these species should be avoided, particularly during the nesting season.

- Pre-disturbance surveys should be conducted within the SEZ for the following desert bird focal species (CalPIF 2009): ash-throated flycatcher, black-tailed gnatcatcher, black-throated sparrow, burrowing owl, common raven, Costa’s hummingbird, crissal thrasher, ladder-backed woodpecker, Le Conte’s thrasher, phainopepla, and verdin. Impacts on potential nesting habitat of these species should be avoided.

- Plant species that positively influence the presence and abundance of desert bird focal species should be avoided to the extent practicable. These species include Goodding’s willow, yucca, Joshua tree, mesquite, honey mesquite, screwbean, desert mistletoe, big saltbush, smoketree, and catclaw acacia (CalPIF 2009).

- Development in Danby Lake should be minimized and development on Homer Wash precluded.

- Take of golden eagles and other raptors should be avoided. Mitigation regarding the golden eagle should be developed in consultation with the USFWS and CDFG. A permit may be required under the Bald and Golden Eagle Protection Act.

If these SEZ-specific design features are implemented in addition to programmatic design features, impacts on bird species could be reduced. Any residual impacts on birds are anticipated to be small to moderate given the relative abundance of potentially suitable habitats in the SEZ region. However, as potentially suitable habitats for a number of the bird species occur throughout much of the SEZ (including the entire SEZ for the greater roadrunner and mourning dove), additional species-specific mitigation of direct effects for those species would be difficult or infeasible.

9.2.11.3 Mammals

9.2.11.3.1 Affected Environment

This section addresses mammal species that are known to occur, or for which potentially suitable habitat occurs, on or within the potentially affected area of the proposed Iron Mountain SEZ. The list of mammal species potentially present in the project area was determined from range maps and habitat information available from the California Wildlife Habitat Relationships System (CDFG 2008). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005, 2007). See Appendix M for additional information on the approach used. Based on species distributions and habitat preferences, about 35 mammal species could occur within the SEZ (CDFG 2008). The following discussion emphasizes big game and other mammal species that (1) have key habitats within or near the Iron Mountain SEZ, (2) are important to humans (e.g., big game, small game, and furbearer species), and/or (3) are representative of other species that share similar habitats.

Big Game

The desert bighorn sheep (*Ovis canadensis nelsoni*) and mule deer (*Odocoileus hemionus*) are the only big game species expected to occur in the area of the proposed Iron Mountain SEZ. Because it is a BLM-sensitive species, the desert bighorn sheep is discussed in Section 9.2.12. The mule deer is common to abundant throughout California, except in deserts and intensely farmed areas (CDFG 2008). It prefers a mosaic of vegetation that has herbaceous openings, dense brush or tree thickets, riparian areas, and abundant edges. Mule deer are browsers and grazers, feeding on shrubs, forbs, and a few grasses. Brush is important for escape cover and for thermal regulation in winter and summer (CDFG 2008). Mule deer in San Bernardino County are found throughout the mountainous areas at elevations of 4,000 to 8,000 ft (1,219 to 2,438 m) (CDFG 2010d). Therefore, mule deer would not be expected to occur with any regularity within Ward Valley where the proposed Iron Mountain SEZ would be located. The highest elevation of the SEZ is about 1,650 ft (503 m) (Section 9.2.1.1.

Other Mammals

A number of small game and furbearer species occur within the area of the proposed Iron Mountain SEZ. These include the American badger (*Taxidea taxus*), black-tailed jackrabbit (*Lepus californicus*), bobcat (*Lynx rufus*), coyote (*Canis latrans*), desert cottontail (*Sylvilagus audubonii*), round-tailed ground squirrel (*Spermophilus tereticaudus*), and white-tailed antelope squirrel (*Ammospermophilus leucurus*) (CDFG 2008).

Nongame (small) mammal species such as bats, mice, kangaroo rats, and shrews also occur within the area of the Iron Mountain SEZ. These include the cactus mouse (*Peromyscus eremicus*), canyon deermouse (*P. crinitus*), desert kangaroo rat (*Dipodomys deserti*), desert shrew (*Notiosorex crawfordi*), desert woodrat (*Neotoma lepida*), little pocket mouse (*Perognathus longimembris*), long-tailed pocket mouse (*Chaetodipus formosus*), Merriam's kangaroo rat (*Dipodomys merriami*), and southern grasshopper mouse (*Onychomys torridus*) (CDFG 2008). The range of nine bat species encompasses the SEZ: big brown bat (*Eptesicus fuscus*), Brazilian free-tailed bat (*Tadarida brasiliensis*), Californian leaf-nosed bat (*Macrotus californicus*), California mastiff bat (*Eumops perotis californicus*), California myotis (*Myotis californicus*), pallid bat (*Antrozous pallidus*), spotted bat (*Euderma maculatum*), Townsend's big-eared bat (*Corynorhinus townsendii*), and western pipistrelle (*Parastrellus hesperus*). Most bat species would only utilize the SEZ during foraging. Roost sites for the species (e.g., caves, hollow trees, rock crevices, or buildings) are absent to scarce within the SEZ.

Table 9.2.11.3-1 provides habitat information for representative mammal species that could occur within the proposed Iron Mountain SEZ. Due to their special status standing, the California mastiff bat, Californian leaf-nose bat, pallid bat, and Townsend's big-eared bat are discussed in Section 9.2.12.1.

9.2.11.3.2 Impacts

The types of impacts that mammals could incur from construction, operation, and decommissioning of utility-scale solar energy facilities are discussed in Section 5.10.2.1. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and the application of any additional mitigation. Section 9.2.11.3.3, below, identifies design features of particular relevance to the proposed Iron Mountain SEZ.

The assessment of impacts on mammal species is based on available information on the presence of species in the affected area, as presented in Section 9.2.11.3.1, following the analysis approach described in Appendix M. Additional NEPA assessments and coordination with state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid or mitigate impacts on mammals (see Section 9.2.11.3.3).

TABLE 9.2.11.3-1 Representative Mammal Species That Could Occur on or in the Affected Area of the Proposed Iron Mountain SEZ and Potential Impacts

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Small Game and Furbearers				
American badger (*Taxidea taxus*)	Open grasslands and deserts, meadows in subalpine and montane forests, alpine tundra. Digs burrows in friable soils. Most common in areas with abundant populations of ground squirrels, prairie dogs, and pocket gophers. Relatively uncommon throughout California. About 2,597,100 acres[f] of potentially suitable habitat occurs in the SEZ region.	58,552 acres of potentially suitable habitat lost (2.3% of available potentially suitable habitat)	156,676 acres of potentially suitable habitat (6.0% of available potentially suitable habitat)	Moderate.
Black-tailed jackrabbit (*Lepus californicus*)	Open plains, fields, and deserts with scattered thickerts or patches of shrubs. Also open, early stages of forests and chaparral habitats. Rests during the day in shallow depressions, and uses shrubs for cover. About 4,592,900 acres of potentially suitable habitat occurs in the SEZ region.	82,404 acres of potentially suitable habitat lost (1.8% of available potentially suitable habitat)	244,526 acres of potentially suitable habitat (5.3% of available potentially suitable habitat)	Moderate.
Bobcat (*Lynx rufus*)	Occurs in nearly all habitats and successional stages. Optimal habitats include mixed woodlands and forest edges, hardwood forests, swamps, forested river bottoms, brushlands, deserts, mountains, and other area with thick undergrowth. Availability of water may limit its distribution in xeric regions. Uses rocky clefts, caves, hollow logs, spaces under fallen trees, and so forth when inactive; usually changes shelter areas daily. About 2,952,500 acres of potentially suitable habitat occurs in the SEZ region.	72,495 acres of potentially suitable habitat lost (2.5% of available potentially suitable habitat)	169,383 acres of potentially suitable habitat (5.7% of available potentially suitable habitat)	Moderate.

TABLE 9.2.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Small Game and Furbearers (Cont.)				
Coyote (*Canis latrans*)	Suitable habitat characterized by interspersions of brush and open areas with free water. Least common in dense coniferous forest. Where human control efforts occur, they are restricted to broken, rough country with abundant shrub cover and a good supply of rabbits or rodents. About 4,936,500 acres of potentially suitable habitat occurs in the SEZ region.	85,217 acres of potentially suitable habitat lost (1.7% of available potentially suitable habitat)	251,084 acres of potentially suitable habitat (5.1% of available potentially suitable habitat)	Moderate. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Desert cottontail (*Sylvilagus audubonii*)	Abundant to common in grasslands, open forests, and desert shrub habitats. Can occur in areas with minimal vegetation as long as adequate cover (e.g., rock piles, fallen logs, fence rows) is present. Tickets and patches of shrubs, vines, and brush also used as cover. About 3,067,800 acres of potentially suitable habitat occurs in the SEZ region.	72,469 acres of potentially suitable habitat lost (2.4% of available potentially suitable habitat)	169,145 acres of potentially suitable habitat (5.5% of available potentially suitable habitat)	Moderate.
Round-tailed ground squirrel (*Spermophilus tereticaudus*)	Optimum habitat includes desert succulent shrub, desert wash, desert scrub, alkali desert scrub, and levees in cropland habitat. Also occurs in urban habitats. Burrows usually at base of shrubs. About 2,641,600 acres of potentially suitable habitat occurs in the SEZ region.	60,091 acres of potentially suitable habitat lost (2.3% of available potentially suitable habitat)	157,403 acres of potentially suitable habitat (6.0% of available potentially suitable habitat)	Moderate. Avoid development in Homer Wash.

TABLE 9.2.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a] Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a] Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Small Game and Furbearers (Cont.)				
White-tailed antelope squirrel (*Ammospermophilus leucurus*)	Common to abundant in California deserts. Optimal habitats are desert scrub, sagebrush, alkali desert scrub, Joshua tree, bitterbrush, and pinyon-juniper. Fairly common in desert riparian, desert succulent shrub, and desert wash habitats. Also occurs in mixed chaparral and annual grassland habitats. Requires friable soil for burrowing. Burrows may be under shrubs or in open, often uses abandoned kangaroo rat burrows. About 4,408,700 acres of potentially suitable habitat occurs in the SEZ region.	85,217 acres of potentially suitable habitat lost (1.9% of available potentially suitable habitat)	251,169 acres of potentially suitable habitat (5.7% of available potentially suitable habitat)	Moderate. Avoid development in Homer Wash. No other species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Nongame (small) Mammals				
Big brown bat (*Eptesicus fuscus*)	Deserts, forests and woodlands, old fields, shrublands, and urban/suburban areas. Uncommon in hot desert habitats. Summer roosts are in buildings, hollow trees, rock crevices, tunnels, and cliff swallow nests. Maternity colonies occur in attics, barns tree cavities, rock crevices, and caves. Caves, mines, and manmade structures used for hibernation sites. About 3,914,500 acres of potentially suitable habitat occurs in the SEZ region.	68,672 acres of potentially suitable habitat lost (1.8% of available potentially suitable habitat)	230,876 acres of potentially suitable habitat (5.9% of available potentially suitable habitat)	Moderate.

TABLE 9.2.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Nongame (small) Mammals (Cont.)				
Brazilian free-tailed bat (*Tadarida brasiliensis*)	Cliffs, deserts, grasslands, old fields, savannas, shrublands, woodlands, and suburban/urban areas. Roosts in buildings, caves, and hollow trees. May roost in rock crevices, bridges, signs, or cliff swallow nests during migration. Large maternity colonies inhabit caves, buildings, culverts, and bridges. About 4,352,800 acres of potentially suitable habitat occurs in the SEZ region.	82,369 acres of potentially suitable habitat lost (1.9% of available potentially suitable habitat)	243,339 acres of potentially suitable habitat (5.6% of available potentially suitable habitat)	Moderate.
Cactus mouse (*Peromyscus eremicus*)	Deserts, shrublands, chaparral, and coniferous woodlands. Occurs on rocky areas and areas with sandy substrates and loamy soils. Nests in rock heaps, stone walls, burrows, brush fences, and woodrat houses. About 3,041,800 acres of potentially suitable habitat occurs in the SEZ region.	73,581 acres of potentially suitable habitat lost (2.4% of available potentially suitable habitat)	169,106 acres of potentially suitable habitat (5.6% of available potentially suitable habitat)	Moderate.
Californian myotis (*Myotis californicus*)	Cliffs, deserts, forests, woodlands, grasslands, savannas, shrublands and savannas. Often uses manmade structures for night roosts. Uses crevices for summer day roosts. May roost on small desert shrubs or on the ground. Hibernates in caves, mines, tunnels, or buildings. May form maternity colonies in rock crevices, under bark, or under eaves of buildings. About 4,148,500 acres of potentially suitable habitat occurs in the SEZ region.	81,733 acres of potentially suitable habitat lost (2.0% of available potentially suitable habitat)	241,714 acres of potentially suitable habitat (5.8% of available potentially suitable habitat)	Moderate.

TABLE 9.2.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a] Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a] Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Nongame (small) Mammals (Cont.)				
Canyon deermouse (*Peromyscus crinitus*)	Found in most desert and chaparral habitats. Gravelly desert pavement, talus, boulders, cliffs, and slickrock—rocky areas with virtually any type of plant cover. About 2,960,700 acres of potentially suitable habitat occurs in the SEZ region.	60,126 acres of potentially suitable habitat lost (2.0% of available potentially suitable habitat)	158,512 acres of potentially suitable habitat (5.4% of available potentially suitable habitat)	Moderate.
Desert kangaroo rat (*Dipodomys deserti*)	Low deserts, deep wind-drifted sandy soil with sparse vegetation, alkali sinks, and shadscale or creosotebush scrub. Nests in burrows dug in mounds, usually under vegetation. About 452,000 acres of potentially suitable habitat occurs in the SEZ region.	13,699 acres of potentially suitable habitat lost (3.0% of available potentially suitable habitat)	12,398 acres of potentially suitable habitat (5.6% of available potentially suitable habitat)	Moderate.
Desert shrew (*Notiosorex crawfordi*)	Generally found in arid areas with adequate cover for nesting and resting. Deserts, semi-arid grasslands with scattered cactus and yucca, chaparral slopes, alluvial fans, sagebrush, gullies, juniper woodlands, riparian areas, and dumps. About 4,701,400 acres of potentially suitable habitat occurs in the SEZ region.	83,516 acres of potentially suitable habitat lost (1.8% of available potentially suitable habitat)	244,330 acres of potentially suitable habitat (5.2% of available potentially suitable habitat)	Moderate.
Desert woodrat (*Neotoma lepida*)	Sagebrush scrub; chaparral; deserts and rocky slopes with scattered cactus, yucca, pine-juniper, or other low vegetation; creosotebush desert; Joshua tree woodlands; scrub oak woodlands, pinyon-juniper woodlands; and riparian zones. Most abundant in rocky areas with Joshua trees. Dens built of debris on ground, among cacti or yucca, along cliffs, among rocks, or occasionally in trees. About 4,602,100 acres of potentially suitable habitat occurs in the SEZ region.	83,836 acres of potentially suitable habitat lost (1.8% of available potentially suitable habitat)	245,109 acres of potentially suitable habitat (5.3% of available potentially suitable habitat)	Moderate.

TABLE 9.2.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Nongame (small) Mammals (Cont.)				
Little pocket mouse (*Perognathus longimembris*)	Common to abundant in southern California deserts. Preferred habitat includes desert riparian, desert scrub, desert wash, and sagebrush. Nests in an underground burrow. Sandy soil preferred for burrowing, but also commonly burrows on gravel washes and on stony soils. About 3,078,900 acres of potentially suitable habitat occurs in the SEZ region.	73,790 acres of potentially suitable habitat lost (2.4% of available potentially suitable habitat)	169,729 acres of potentially suitable habitat (5.5% of available potentially suitable habitat)	Moderate. Avoid development in Homer Wash.
Long-tailed pocket mouse (*Chaetodipus formosus*)	Common in sagebrush, desert scrub, and desert succulent shrub habitats with rocky or stony groundcover. Often inhabits rocky washes and canyon mouths. Uses underground burrows. About 4,531,200 acres of potentially suitable habitat occurs in the SEZ region.	83,307 acres of potentially suitable habitat lost (1.8% of available potentially suitable habitat)	243,563 acres of potentially suitable habitat (5.4% of available potentially suitable habitat)	Moderate. Avoid development in Homer Wash.
Merriam's kangaroo rat (*Dipodomys merriami*)	Most widespread kangaroo rat in California. In southern Califorbnia, occurs in desert scrub and alkali desert scrub, sagebrush, Joshua tree, and pinyon-juniper habitats. Uses desert flats or slopes with sparse to moderate canopy coverage and sandy to gravelly subsrates. Uses underground burrows that are often located at the base of a shrub. About 3,121,700 acres of potentially suitable habitat occurs in the SEZ region.	74,293 acres of potentially suitable habitat lost (2.4% of available potentially suitable habitat)	171,122 acres of potentially suitable habitat (4.2% of available potentially suitable habitat)	Moderate.

TABLE 9.2.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Nongame (small) Mammals (Cont.)				
Southern grasshopper mouse (*Onychomys torridus*)	Hot, arid valleys and scrub deserts with sparse and scattered vegetation such as mesquite, creosotebush cholla, yucca, and short grasses. Frequents scrub habitats with friable soils for digging. Also uses abandoned underground burrows. About 3,095,700 acres of potentially suitable habitat occurs in the SEZ region.	73,790 acres of potentially suitable habitat lost (2.4% of available potentially suitable habitat)	169,801 acres of potentially suitable habitat (5.5% of available potentially suitable habitat)	Moderate.
Spotted bat (*Euderma maculatum*)	Mostly found in the foothills, mountains, and desert regions of southern California. Roosts in caves and cracks or crevices in cliffs and canyons. About 4,836,900 acres of potentially suitable habitat occurs in the SEZ region.	85,217 acres of potentially suitable habitat lost (1.8% of available potentially suitable habitat)	251,169 acres of potentially suitable habitat (5.2% of available potentially suitable habitat)	Moderate. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Western pipistrelle (*Parastrellus esperus*)	Deserts and lowlands, desert mountain ranges, desert scrub flats, and rocky canyons. Roosts mostly in rock crevices, sometimes mines and caves, and rarely in buildings. Suitable roosts occur in rocky canyons and cliffs. Most abundant bat in desert regions. About 4,633,600 acres of potentially suitable habitat occurs in the SEZ region.	85,217 acres of potentially suitable habitat lost (1.8% of available potentially suitable habitat)	251,169 acres of potentially suitable habitat (5.4% of available potentially suitable habitat)	Moderate. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

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TABLE 9.2.11.3-1 (Cont.)

[a] Maximum area of potentially suitable habitat affected relative to total available potentially suitable habitat within the SEZ region (i.e., a 50-mi [80-km] radius from the center of the SEZ). Habitat availability was determined from potentially suitable land cover for each species (USGS 2004, 2005, 2007).

[b] Direct effects within the SEZ consist of ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations. A maximum of 85,217 acres would be developed in the SEZ.

[c] The area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary. Indirect effects include effects from surface runoff, dust, noise, lighting, etc., from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance away from the SEZ boundary.

[d] Overall impact magnitude categories were based on professional judgment and include (1) *small*: ≤1% of potentially suitable habitat for the species would be lost, and the activity would not result in a measurable change in the carrying capacity or population size in the affected area; (2) *moderate*: >1 but ≤10% of potentially suitable habitat for the species would be lost and the activity would potentially result in a measurable but moderate (not destabilizing) change in the carrying capacity or population size in the affected area; and (3) *large*: >10% of potentially suitable habitat for the species would be lost and the activity would result in a potentially large, measurable, and destabilizing change in the carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects because those effects would be difficult to mitigate. Programmatic design features would reduce most indirect effects to negligible levels.

[e] Species-specific mitigation is presented for those species that have particular habitat features that could be readily avoided. For species or individuals occurring outside the SEZ (in the area of indirect effects), no mitigation measures beyond required programmatic design features have been identified.

[f] To convert acres to km^2, multiply by 0.004047.

Sources: CDFG (2008); NatureServe (2010); USGS (2004, 2005, 2007).

Table 9.2.11.3-1 summarizes the potential impacts on representative mammal species resulting from solar energy development (with the implementation of required programmatic design features) in the proposed Iron Mountain SEZ.

Direct impacts on small game, furbearers, and nongame (small) mammal species would be moderate, as 1.7 to 3.0% of potential habitats identified for the species would be lost (Table 9.2.11.3-1). Larger areas of potentially suitable habitat for these species occur within the area of potential indirect effects (i.e., ranging from 2.7% for the desert kangaroo rat to 6.0% for the American badger and round-tailed ground squirrel). Other impacts on mammals could result from collision with fences and vehicles, surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, noise, lighting, spread of invasive species, accidental spills, and harassment. These indirect impacts are expected to be negligible with implementation of programmatic design features

Decommissioning of facilities and reclamation of disturbed areas after operations cease could result in short-term negative impacts on individuals and habitats adjacent to project areas, but long-term benefits would accrue if suitable habitats were restored in previously disturbed areas. Section 5.10.2.1.4 provides an overview of the impacts of decommissioning and reclamation on wildlife. Of particular importance for mammal species would be the restoration of original ground surface contours, soils, and native plant communities associated with semiarid shrublands.

9.2.11.3.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A, Section A.2.2, would reduce the potential for effects on mammals. While some SEZ-specific design features are best established when project details are considered, one design feature that can be identified at this time is as follows:

- Development in Homer Wash should be avoided in order to reduce impacts on species such as the round-tailed ground squirrel, white-tailed antelope squirrel, little pocket mouse, long-tailed pocket mouse, and any other mammal species that inhabit wash habitats.

If this SEZ-specific design feature is implemented in addition to programmatic design features, impacts on mammal species could be reduced. Any residual impacts on mammals are anticipated to be moderate given the relative abundance of suitable habitats in the SEZ region. However, because potentially suitable habitats for a number of the mammal species occur throughout much of the SEZ, additional species-specific mitigation of direct effects for those species would be difficult or infeasible.

9.2.11.4 Aquatic Biota

9.2.11.4.1 Affected Environment

This section addresses aquatic habitats and biota that are known to occur on the proposed Iron Mountain SEZ itself or within an area that could be affected, either directly or indirectly, by activities associated with solar energy development within the SEZ. For the proposed Iron Mountain SEZ, the area of direct effects was considered to be the entire SEZ area. As discussed in Section 9.2.1.1, a new access road would not be needed because State Route 62 passes through the southern portion of the SEZ. Also, for this analysis, the impacts of construction and operation of transmission lines outside of the SEZ were not assessed, assuming that the existing 230-kV transmission line might be used to connect some new solar facilities to load centers and that additional project-specific analysis would be performed for new transmission construction or line upgrades. The area of potential indirect impacts on aquatic biota from SEZ development was considered to extend up to 5 mi (8 km) beyond the SEZ boundary.

No perennial surface water bodies, seeps, or springs are present on the proposed Iron Mountain SEZ. Several ephemeral drainages do cross the site and drain into Danby Lake. Dry lakes and associated wetlands in desert regions typically do not support aquatic habitat, but may temporarily contain aquatic biota adapted to desiccating conditions (Graham 2001). On the basis of information from ephemeral pools in the American Southwest, ostracods (seed shrimp) and small planktonic crustaceans (e.g., copepods or cladocerans) are expected to be present, and larger branchiopod crustaceans such as fairy shrimp could occur (Graham 2001). Various types of insects that have aquatic larval stages, such as dragonflies and a variety of midges and other fly larvae, may also occur depending on pool longevity, distance to permanent water features, and the abundance of other invertebrates for prey (Graham 2001). but site-specific surveys would be necessary to characterize aquatic biota, if present.

The only stream feature within the area considered for indirect effects is the constructed CRA. Approximately 7 mi (11 km) of the aqueduct is immediately adjacent to the southern and western SEZ boundaries, with a total of approximately 33 mi (53 km) of the aqueduct within the area of indirect effects. The aqueduct, which diverts water from the Colorado River to supply drinking water to portions of southern California, can contain some aquatic biota when water is present. In 2007, quagga mussels (*Dreissena rostriformis bugensis*), an invasive nonnative mussel species, was discovered in the aqueduct (USGS 2008a). The presence of these mussels, which can attach to and clog intakes for pumps and other piping systems, is a concern for operations of the aqueduct. As a consequence, various treatment programs have been implemented, including periodic draining of the aqueduct and the periodic use of chlorine to kill aquatic organisms that are present. However, aside from concerns regarding this invasive species, important communities of aquatic biota are not present in portions of the aqueduct system adjacent to the proposed Iron Mountain SEZ.

As described in Section 9.2.9.1.1, no wetlands are present within the proposed SEZ. One intermittently-flooded, riverine wetland is located 5 mi (8 km) south of the proposed SEZ (Figure 9.2.9-1). The NWI classification for this wetland indicates that surface water is usually absent but may be present for variable periods during the year. Precipitation runoff from the SEZ and surrounding areas is transmitted, via ephemeral drainages, to Danby Lake, a normally dry lake bed, in the northwestern portion of the proposed SEZ (Section 9.2.9.1.1). Releases from the CRA are also temporarily directed into Danby Lake during maintenance periods. Aquatic habitat and communities are not likely to be present in Danby Lake for an extended time, although opportunistic crustaceans and aquatic insect larvae adapted to desert conditions may be present during wet periods. More detailed site survey data are needed to characterize the aquatic biota in Danby Lake.

Outside of the indirect effects area, but within 50 mi of the SEZ, there are approximately 2 mi (3 km) of perennial streams, 11 mi (18 km) of intermittent streams, and 124 mi (200 km) of canal (CRA). There are approximately 18,930 acres (77 km^2) of lake and reservoir habitat within 50 mi (80 km) of the SEZ, although there are no lakes or reservoirs within the area considered for analysis of direct or indirect effects. Overall, the combined amount of natural aquatic habitat provided by areas within the SEZ and within the area of potential indirect effects is less than 1% of the amount available within the overall analysis area.

9.2.11.4.2 Impacts

The types of impacts that could occur on aquatic habitats and biota from development of utility-scale solar energy facilities are discussed in Section 5.10.3.

No permanent water bodies, perennial streams, or wetlands are present within the boundaries of the Iron Mountain SEZ. Consequently, there would be no direct impacts on aquatic habitats from construction and operation of utility-scale solar energy facilities within the proposed SEZ. Aquatic communities in Danby Lake, if present, may be affected by ground disturbance, runoff, and fugitive dust during construction. See Section 5.10.3 for a detailed description of potential impacts on aquatic biota resulting from solar energy development activities. More detailed site surveys of ephemeral and intermittent surface waters would be necessary to determine whether solar energy development activities would result in direct or indirect impacts on aquatic biota.

Aside from the CRA, there are no permanent water bodies or perennial streams located within the identified area of indirect effects that extends 5 mi (8 km) from the boundaries of the SEZ. As discussed in Section 9.2.11.4.1, the aqueduct does not contain any important natural aquatic communities. The nearest wetland area that could be indirectly affected by solar energy development activities is approximately 5 mi (8 km) from the SEZ boundaries and water for that wetland does not originate from the Iron Mountain SEZ. Consequently, the potential for impacts on aquatic communities in that wetland would be negligible.

In arid environments, reductions in the quantity of water in aquatic habitats are of particular concern. Because drainage from the Iron Mountain SEZ enters Danby Lake, which is a dry lake that contains no aquatic habitat, there would be no effect on aquatic biota from alterations in site runoff patterns or use of water collected from the SEZ. Water quantity in aquatic habitats could also be affected if significant amounts of surface water or groundwater were utilized for power plant cooling water, for washing mirrors, or for other needs. The greatest need for water would occur if technologies employing wet cooling, such as parabolic trough or power tower, were developed at the site; the associated impacts would ultimately depend on the water source used (including groundwater from aquifers at various depths). As identified in Section 9.2.9.1.3, it seems unlikely that approval could be obtained to withdraw water from the CRA. Nevertheless, the aqueduct itself contains no important aquatic species that need to be protected. Obtaining cooling water from other perennial surface water features in the region could affect water levels and, as a consequence, aquatic organisms in those water bodies. Additional details regarding the volume of water required and the types of organisms present in potentially affected water bodies would be required in order to further evaluate the potential for impacts from water withdrawals.

As described in Section 5.10.3, water quality in aquatic habitats could be affected by the introduction of contaminants such as fuels, lubricants, or pesticides/herbicides during site characterization, construction, operation, or decommissioning for a solar energy facility. There is the potential for runoff containing contaminants to enter Danby Lake especially if construction occurs nearby. Danby Lake is typically dry and is not expected to contain aquatic habitat. However, aquatic biota may be present seasonally, and they could be affected by contaminants. See Section 5.10.3 for a detailed description of potential impacts on aquatic biota resulting from solar energy development activities.

9.2.11.4.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A, Section A.2.2, could greatly reduce or eliminate the potential for effects on aquatic biota and aquatic habitats from development and operation of solar energy facilities. While some SEZ-specific design features are best established when project details are being considered, a design feature that can be identified at this time follows:

- The amount of ground disturbance near Danby Lake should be minimized.

If this design feature is implemented in addition to programmatic project design features and if the utilization of water from groundwater or surface water sources is adequately controlled to maintain sufficient water levels in nearby aquatic habitats, the potential impacts on aquatic biota and habitats from solar energy development at the Iron Mountain SEZ would be negligible.

9.2.12 Special Status Species (Threatened, Endangered, Sensitive, and Rare Species)

This section addresses special status species that are known to occur, or for which suitable habitat occurs, on or within the potentially affected area of the proposed Iron Mountain SEZ. Special status species include the following types of species[3]:

- Species listed as threatened or endangered under the ESA;

- Species that are proposed for listing, are under review, or are candidates for listing under the ESA;

- Species that are listed as threatened or endangered by the State of California under the CESA or that are identified as fully protected by the state[4];

- Species that are listed by the BLM as sensitive; and

- Species that have been ranked by the states of California or Arizona as S1 or S2, or species of concern by the state of California or the USFWS; hereafter referred to as "rare" species. Arizona does not yet maintain a separate list of species of concern.

Special status species known to occur within 50 mi (80 km) of the Iron Mountain SEZ center (i.e., the SEZ region) were determined from natural heritage records available through NatureServe Explorer (NatureServe 2010) and information provided by the CWHRS (CDFG 2010a), in the CNDDB (CDFG 2010b), by CAReGAP) (Davis et al. 1998; USGS 2010a), and by SWReGAP (USGS 2004, 2005, 2007). Information reviewed consisted of county-level occurrences as determined from NatureServe, point and polygon element occurrences as determined from CNDDB, as well as modeled land cover types and predicted suitable habitats for the species within the 50-mi (80-km) region as determined from CAReGAP and SWReGAP. The 50-mi (80-km) SEZ region intersects Riverside and San Bernardino Counties, California, and La Paz and Mohave Counties, Arizona. However, the SEZ and affected area occur only in southern San Bernardino County and northern Riverside County, California. See Appendix M for additional information on the approach used to identify species that could be affected by development within the SEZ.

9.2.12.1 Affected Environment

The affected area considered in the assessment included the areas of direct and indirect effects. The area of direct effects was defined as the area that would be physically modified

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[3] See Section 4.6.4 for definitions of these species categories. Note that some of the categories of species included here do not fit BLM's definition of special status species as defined in BLM Manual 6840 (BLM 2008a). These species are included here to ensure broad consideration of species that may be most vulnerable to impacts.

[4] State-listed species are those listed as threatened or endangered under the CESA; California fully protected species are species that receive the strictest take provisions as identified by the CDFG.

during project development (i.e., where ground-disturbing activities would occur). For the Iron Mountain SEZ, the area of direct effect was limited to the SEZ itself. Because of the proximity of existing infrastructure, the impacts of construction and operation of transmission lines outside of the SEZ are not assessed, assuming that the existing transmission might be used to connect some new solar facilities to load centers and that additional project-specific analysis would be conducted for new transmission construction or line upgrades. Similarly, the impacts of construction or upgrades to access roads were not assessed for this SEZ because of the proximity of State Route 62 (see Section 9.2.1.2 for a discussion of development assumptions for this SEZ). The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary where ground-disturbing activities would not occur but that could be indirectly affected by activities in the area of direct effect. Indirect effects considered in the assessment included effects from surface runoff, dust, noise, lighting, and accidental spills from the SEZ, but do not include ground-disturbing activities. The potential magnitude of indirect effects would decrease with increasing distance away from the SEZ. This area of indirect effect was identified on the basis of professional judgment and was considered sufficiently large to bound the area that would potentially be subject to indirect effects. The affected area includes both the direct and indirect effects areas.

The primary habitat type in the affected area is Sonoran-Mojave creosotebush-white bursage desert scrub (see Section 9.2.10). Potentially unique habitats in the affected area in which special status species may reside include desert dunes, rocky cliffs and outcrops, and desert playas. Aquatic and riparian habitats in the affected area occur within and along Danby Lake, intermittent desert washes (e.g., Homer Wash), and the CRA operated by the MWD (see Section 9.2.9; Figure 9.2.12.1-1).

All special status species that are known to occur within the Iron Mountain SEZ region (i.e., within 50 mi [80 km] of the center of the SEZ) are listed, with their status, nearest recorded occurrence, and habitats in Appendix J. Of these species, there are 43 that could occur on or in the affected area, based on recorded occurrences or the presence of potentially suitable habitat in the area. These species, their status, and their habitats are presented in Table 9.2.12.1-1. For many of the species listed in the table, their predicted potential occurrence in the affected area is based only on a general correspondence between mapped CAReGAP land cover types and descriptions of species habitat preferences. This overall approach to identifying species in the affected area probably overestimates the number of species that actually occur in the affected area. For many of the species identified as having potentially suitable habitat in the affected area, the nearest known occurrence is more than 20 mi (32 m) away from the SEZ.

Based on CNDDB records and information provided by the CDFG and USFWS, there are five special status species known to occur within the affected area of the Iron Mountain SEZ: Harwood’s eriastrum, Mojave fringe-toed lizard, Bendire’s thrasher, hepatic tanager, and Nelson’s bighorn sheep. In addition, designated critical habitat for the desert tortoise occurs within the affected area adjacent to the SEZ boundary. There are no groundwater-dependent species in the vicinity of the SEZ based upon CNDDB records, comments provided by the USFWS (Stout 2009), and the evaluation of groundwater resources in the Iron Mountain SEZ region (Section 9.2.9).

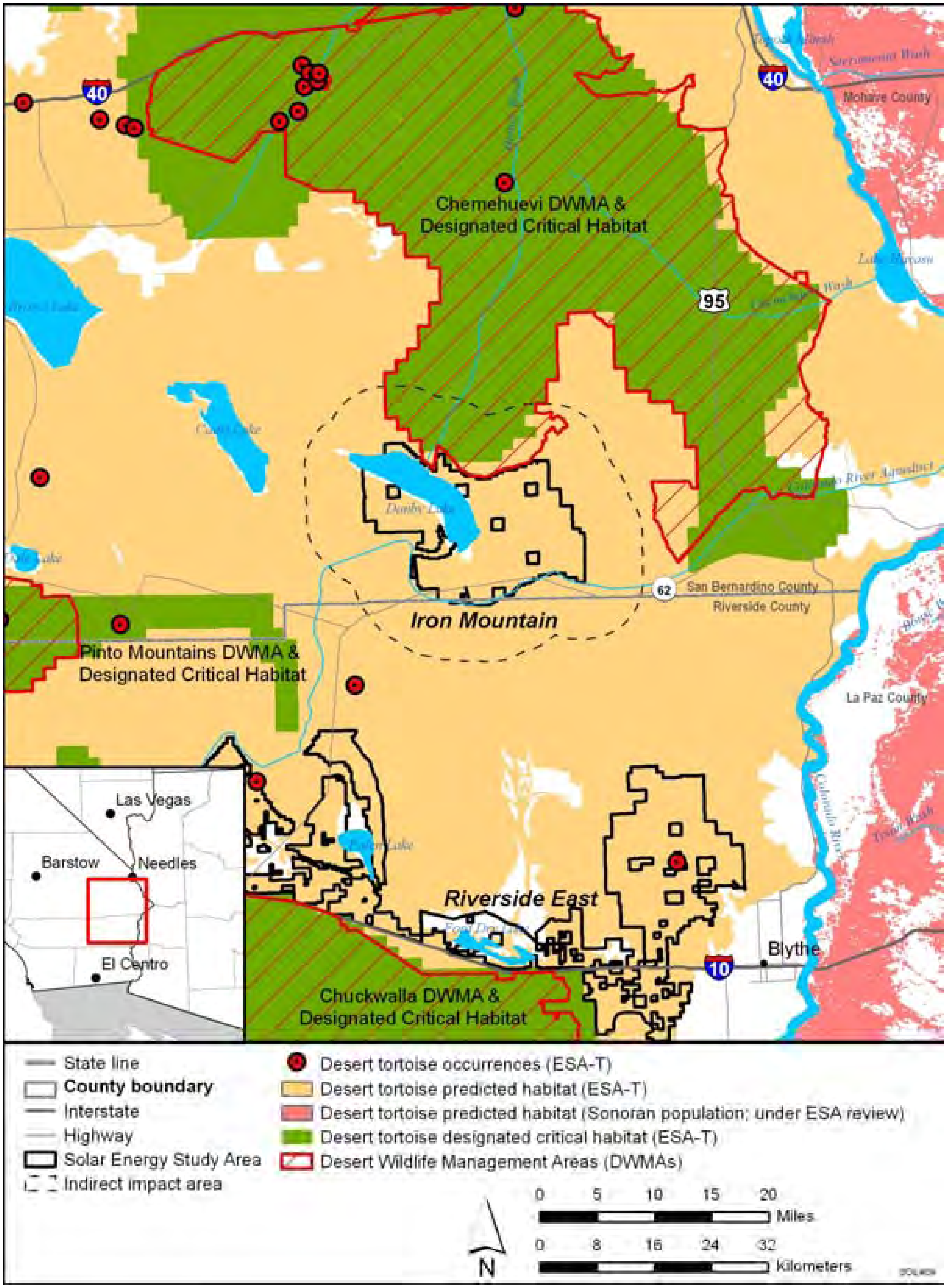

FIGURE 9.2.12.1-1 Known or Potential Occurrences of Species Listed as Endangered, Threatened, or under Review for Listing under the ESA That May Occur in the Proposed Iron Mountain SEZ Affected Area (Sources: CDFG 2010b)

TABLE 9.2.12.1-1 Habitats, Potential Impacts, and Potential Mitigation for Special Status Species That Could Be Affected by Solar Energy Development on the Proposed Iron Mountain SEZ

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants						
Abrams' spurge	*Chamaesyce abramsiana*	CA-S1	Sandy substrates within creosotebush scrub communities in the Mojave and Sonoran Deserts at elevations below 3,000 ft.[h] Nearest recorded occurrence is 38 mi[i] from the SEZ. About 2,463,149 acres[j] of potentially suitable habitat occurs within the SEZ region.	58,552 acres of potentially suitable habitat lost (2.4% of available habitat)	156,519 acres of potentially suitable habitat (6.4% of available habitat)	Moderate overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance of occupied habitats on the SEZ; translocation of individuals from areas of direct effects; or compensatory mitigation of direct effects on occupied habitats could reduce impacts. Note that these same potential mitigations apply to all special status plants.
California ditaxis	*Ditaxis serrata* var. *californica*	CA-S2	Sonoran Desert scrub and creosotebush scrub communities at elevations between 100 and 3,300 ft. Nearest recorded occurrence is 33 mi from the SEZ. About 2,597,477 acres of potentially suitable habitat occurs within the SEZ region.	60,091 acres of potentially suitable habitat lost (2.3% of available habitat)	157,246 acres of potentially suitable habitat (6.1% of available habitat)	Moderate overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.

TABLE 9.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
California satintail	*Imperata brevifolia*	CA-S2	Occurs in chaparral, coastal sage scrub, creosotebush, desert scrub, mesic riparian scrub, and alkaline meadow and seep communities. Elevation ranges between 0 and 1,650 ft. Nearest recorded occurrences are 43 mi from the SEZ. About 2,626,502 acres of potentially suitable habitat occurs within the SEZ region.	60,091 acres of potentially suitable habitat lost (2.3% of available habitat)	157,331 acres of potentially suitable habitat (6.0% of available habitat)	Moderate overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
Chaparral sand-verbena	*Abronia villosa* var. *aurita*	BLM-S; CA-S2	Endemic to southern California. Inhabits chaparral desert sand dunes at elevations between 350 and 5,250 ft. Historically occurred on and in the vicinity of the SEZ; the species has not been recorded in the project area since 1964. Most recent recorded occurrences are 30 mi south of the SEZ. About 61,037 acres of potentially suitable habitat occurs within the SEZ region.	209 acres of potentially suitable habitat lost (0.3% of available habitat)	695 acres of potentially suitable habitat (1.1% of available habitat)	Small overall impact. Avoiding or minimizing disturbance to desert dunes and sand transport systems could reduce impacts. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.

TABLE 9.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Coves' cassia	*Senna covesii*	CA-S2	Sonoran Desert dry washes and slopes with sandy substrates within desert scrub and creosotebush scrub communities. Elevation ranges between 1,000 and 3,500 ft. Nearest recorded occurrence is 25 mi from the SEZ. About 3,017,394 acres of potentially suitable habitat occurs within the SEZ region.	73,581 acres of potentially suitable habitat lost (2.4% of available habitat)	169,034 acres of potentially suitable habitat (5.6% of suitable habitat)	Moderate overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
Desert pincushion	*Coryphantha chlorantha*	CA-S1	Gravelly bajadas, limestone, or dolomite rocky slopes associated with desert scrub communities within pinyon-juniper woodlands and Joshua tree woodlands. Elevation ranges between 148 and 7,875 ft. Nearest recorded occurrence is 38 mi from the SEZ. About 2,626,374 acres of potentially suitable habitat occurs within the SEZ region.	60,091 acres of potentially suitable habitat lost (2.3% of available habitat)	157,331 acres of potentially suitable habitat (6.0% of available habitat)	Moderate overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.

TABLE 9.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Desert spike-moss	*Selaginella eremophila*	CA-S2	Gravelly or rocky slopes within creosotebush scrub and Sonoran Desert scrub communities. Elevation ranges between 650 and 2,950 ft. Nearest recorded occurrence is 35 mi from the SEZ. About 2,597,477 acres of potentially suitable habitat occurs within the SEZ region.	60,091 acres of potentially suitable habitat lost (2.3% of available habitat)	157,246 acres of potentially suitable habitat (6.1% of available habitat)	Moderate overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
Dwarf germander	*Teucrium cubense* ssp. *depressum*	CA-S2	Desert dunes, playas, riparian, creosotebush scrub, and desert scrub communities. Elevation ranges between 150 and 1,300 ft. Nearest recorded occurrence is 35 mi from the SEZ. About 2,832,948 acres of potentially suitable habitat occurs within the SEZ region.	82,356 acres of potentially suitable habitat lost (2.9% of available habitat)	162,520 acres of potentially suitable habitat (5.7% of available habitat)	Moderate overall impact. Avoiding or minimizing disturbance to playas and desert dunes and sand transport systems could reduce impacts. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.

TABLE 9.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Emory's crucifixion-thorn	*Castela emoryi*	CA-S2	Slightly wet alluvial bottomlands associated with basalt flows within Mojave Desert scrub, non-saline playas, creosotebush scrub, and Sonoran Desert scrub communities. Elevation ranges between 295 and 2,200 ft. Nearest recorded occurrence is 25 mi from the SEZ. About 2,749,714 acres of potentially suitable habitat occurs within the SEZ region.	82,147 acres of potentially suitable habitat lost (3.0% of available habitat)	161,753 acres of potentially suitable habitat (5.9% of available habitat)	Moderate overall impact. Avoiding or minimizing disturbance to playas could reduce impacts. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
Glandular ditaxis	*Ditaxis claryana*	CA-S1	Sandy substrates within desert scrub communities at elevations below 1,525 ft. Nearest recorded occurrence is 30 mi from the SEZ. About 2,626,372 acres of potentially suitable habitat occurs within the SEZ region.	60,091 acres of potentially suitable habitat lost (2.3% of available habitat)	157,331 acres of potentially suitable habitat (6.0% of available habitat)	Moderate overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.

TABLE 9.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Harwood's eriastrum[k]	***Eriastrum harwoodii***	BLM-S; CA-S2	Known from fewer than 20 occurrences in southern California on desert dunes and other sandy habitats at elevations between 650 and 3,000 ft. Known to occur on the SEZ and in the affected area. About 60,907 acres of potentially suitable habitat occurs within the SEZ region.	209 acres of potentially suitable habitat lost (0.3% of available habitat)	695 acres of potentially suitable habitat (1.1% of available habitat)	Small overall impact. Avoiding or minimizing disturbance to dunes and sand transport systems could reduce impacts. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
Harwood's milkvetch	*Astragalus insularis* var. *harwoodii*	CA-S2	Sonoran Desert of Arizona and California on sandy or gravelly substrates of desert dunes within desert scrub communities. Elevation ranges between 0 and 2,325 ft. Nearest occurrences are approximately 37 mi from the SEZ. About 2,687,147 acres of potentially suitable habitat occurs within the SEZ region.	60,300 acres of potentially suitable habitat lost (2.2% of available habitat)	158,026 acres of potentially suitable habitat (5.9% of available habitat)	Moderate overall impact. Avoiding or minimizing disturbance to dunes and sand transport systems could reduce impacts. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.

TABLE 9.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Howe's hedgehog cactus	*Echinocereus engelmannii* var. *howei*	BLM-S; CA-S1; FWS-SC	Known from two locations near Needles, California in Mojave Desert scrub communities at elevations near 1,475 ft. Nearest recorded occurrences are 45 mi north of the SEZ. About 2,537,769 acres of potentially suitable habitat occurs within the SEZ region.	60,091 acres of potentially suitable habitat lost (2.4% of available habitat)	157,331 acres of potentially suitable habitat (6.2% of available habitat)	Moderate overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
Jackass-clover	*Wislizenia refracta* ssp. *refracta*	CA-S1	Mojave and northern Sonoran Deserts in dunes, sandy washes, roadsides, and playas within creosotebush scrub, alkali sink, or desert scrub communities. Elevation ranges between 2,000 and 2,600 ft. Nearest recorded occurrence is 20 mi south of the SEZ. About 614,279 acres of potentially suitable habitat occurs within the SEZ region.	36,166 acres of potentially suitable habitat lost (5.9% of available habitat)	17,682 acres of potentially suitable habitat (2.9% of available habitat)	Moderate overall impact. Avoiding or minimizing disturbance to dunes and sand transport systems, playas, or washes could reduce impacts. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.

TABLE 9.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Lobed ground-cherry	*Physalis lobata*	CA-S1	Northeastern Sonoran and southeastern Mojave Deserts on decomposed granitic substrates within creosotebush scrub, alkali sink, desert scrub, and playas communities. Elevation ranges between 1,650 and 2,600 ft. Nearest recorded occurrences are 25 mi from the SEZ. About 2,749,714 acres of potentially suitable habitat occurs within the SEZ region.	82,147 acres of potentially suitable habitat lost (3.0% of available habitat)	161,753 acres of potentially suitable habitat (5.9% of available habitat)	Moderate overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
Munz's cholla	*Opuntia munzii*	BLM-S; CA-S1; FWS-SC	Gravelly or sandy to rocky soils, often on lower bajadas, washes, and flats. Also occurs on hills and in canyons. Occurs in Sonoran Desert creosotebush shrub communities at elevations below 3,280 ft. Nearest recorded occurrences are 50 mi from the SEZ. About 4,404,392 acres of potentially suitable habitat occurs within the SEZ region.	82,271 acres of potentially suitable habitat lost (1.9% of available habitat)	244,144 acres of potentially suitable habitat (5.5% of available habitat)	Moderate overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.

TABLE 9.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Orocopia sage	*Salvia greatae*	BLM-S; CA-S2; FWS-SC	Creosotebush scrub communities and dry washes at elevations less than 2,600 ft. Nearest recorded occurrence is 33 mi southwest of the SEZ. About 2,854,303 acres of potentially suitable habitat occurs within the SEZ region.	72,042 acres of potentially suitable habitat lost (2.5% of available habitat)	168,222 acres of potentially suitable habitat (5.9% of available habitat)	Moderate overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
Parish's club-cholla	*Grusonia parishii*	CA-S2	Silty, sandy, or gravelly flats, dunelets, and hills within Joshua tree woodlands, creosotebush scrub, and desert scrub communities. Elevation ranges between 100 and 5,000 ft. Nearest recorded occurrences are 37 mi from the SEZ. About 2,687,147 acres of potentially suitable habitat occurs within the SEZ region.	60,300 acres of potentially suitable habitat lost (2.2% of available habitat)	158,026 acres of potentially suitable habitat (5.9% of available habitat)	Moderate overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
Pink fairy-duster	*Calliandra eriophylla*	CA-S2	Sandy or rocky substrates in creosote and desert scrub communities. Elevation ranges between 390 and 4,900 ft. Nearest recorded occurrence is 35 mi from the SEZ. About 2,626,372 acres of potentially suitable habitat occurs within the SEZ region.	60,091 acres of potentially suitable habitat lost (2.3% of available habitat)	157,331 acres of potentially suitable habitat (6.0% of available habitat)	Moderate overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.

TABLE 9.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Playa milkvetch	*Astragalus allochrous* var. *playanus*	CA-S1	Known from the eastern Mojave Desert on sandy soils within desert scrub communities at elevations near 2,600 ft. Nearest occurrences are approximately 15 mi from the SEZ. About 2,537,900 acres of potentially suitable habitat occurs within the SEZ region.	60,091 acres of potentially suitable habitat lost (2.4% of available habitat)	157,331 acres of potentially suitable habitat (6.2% of available habitat)	Moderate overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
Saguaro cactus	*Carnegiea gigantea*	CA-S1	Endemic to the Sonoran Desert along the Colorado River from the Whipple Mountains to Laguna Dam on rocky substrates within Sonoran desert scrub and creosote scrub communities at elevations between 160 and 4,900 ft. Nearest recorded occurrence is 35 mi from the SEZ. About 2,921,907 acres of potentially suitable habitat occurs within the SEZ region.	60,126 acres of potentially suitable habitat lost (2.1% of available habitat)	158,355 acres of potentially suitable habitat (5.4% of available habitat)	Moderate overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.

TABLE 9.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Sand evening-primrose	*Camissonia arenaria*	CA-S2	Sandy washes and rocky slopes within Sonoran Desert scrub communities at elevations below 3,000 ft. Nearest recorded occurrence is 48 mi from the SEZ. About 3,313,061 acres of potentially suitable habitat occurs within the SEZ region.	73,616 acres of potentially suitable habitat lost (2.2% of available habitat)	170,058 acres of potentially suitable habitat (5.1% of available habitat)	Moderate overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
Small-flowered androstephium	*Androstephium breviflorum*	CA-S1	Dry sandy to rocky soil substrates within creosotebush scrub and Mojave Desert scrub at elevations between 720 and 2,100 ft. Nearest occurrences are approximately 15 mi from the SEZ. About 2,598,676 acres of potentially suitable habitat occurs within the SEZ region.	60,300 acres of potentially suitable habitat lost (2.3% of available habitat)	158,026 acres of potentially suitable habitat (6.1% of available habitat)	Moderate overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
Spear-leaf matelea	*Matelea parvifolia*	CA-S2	Endemic to southeastern California on rocky substrates within creosotebush and desert scrub communities at elevations between 1,450 and 3,600 ft. Nearest recorded occurrences are 35 mi from the SEZ. About 2,626,372 acres of potentially suitable habitat occurs within the SEZ region.	60,091 acres of potentially suitable habitat lost (2.3% of available habitat)	157,331 acres of potentially suitable habitat (6.0% of available habitat)	Moderate overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.

TABLE 9.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Spiny cliff-brake	*Pellaea truncata*	CA-S2	Rocky slopes and cliffs of volcanic or granitic derivation within pinyon-juniper woodlands. Elevation ranges between 4,000 and 7,000 ft. Nearest recorded occurrences are 45 mi from the SEZ. About 1,563,400 acres of potentially suitable habitat occurs within the SEZ region.	10,000 acres of potentially suitable habitat lost (0.6% of available habitat)	76,000 acres of potentially suitable habitat (4.9% of available habitat)	Small overall impact. Avoiding or minimizing disturbance to rocky cliffs and outcrops could reduce impacts. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
Three-awned grama	*Bouteloua trifida*	CA-S2	Eastern Mojave Desert mountains on dry, rocky, often calcareous slopes within desert scrub communities. Elevation ranges between 2,300 and 6,500 ft. Nearest recorded occurrence is 19 mi east of the SEZ. About 2,537,769 acres of potentially suitable habitat occurs within the SEZ region.	60,091 acres of potentially suitable habitat lost (2.4% of available habitat)	157,331 acres of potentially suitable habitat (6.2% of available habitat)	Moderate overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.

TABLE 9.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
White-margined beardtongue	*Penstemon albomarginatus*	BLM-S; CA-S1; FWS-SC	Sand dune habitats and Mojave Desert scrub communities at elevations below 3,600 ft. Nearest recorded occurrences are 25 mi northwest of the SEZ. About 2,598,676 acres of potentially suitable habitat occurs within the SEZ region.	60,300 acres of potentially suitable habitat lost (2.3% of available habitat)	158,026 acres of potentially suitable habitat (6.1% of available habitat)	Moderate overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
Wiggins' cholla	*Opuntia wigginsii*	CA-S1	Sandy substrates of small washes and flats within creosotebush scrub and Sonoran desert scrub communities. Elevation ranges between 100 and 2,900 ft. Nearest recorded occurrences are 50 mi from the SEZ. About 2,900,300 acres of potentially suitable habitat occurs within the SEZ region.	73,581 acres of potentially suitable habitat lost (2.5% of available habitat)	168,949 acres of potentially suitable habitat (5.8% of available habitat)	Moderate overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.

TABLE 9.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Arthropods						
Bradley's cuckoo wasp	*Ceratochrysis bradleyi*	CA-S1	Endemic to California where it is known only from eastern Riverside County in Sonoran Desert scrub, creosotebush scrub, yucca and cholla cactus, saltbush, and desert dune communities. Nearest recorded occurrence is 30 mi south of the SEZ. About 2,687,147 acres of potentially suitable habitat occurs within the SEZ region.	60,300 acres of potentially suitable habitat lost (2.2% of available habitat)	158,026 acres of potentially suitable habitat (5.9% of available habitat)	Moderate overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance of occupied habitats on the SEZ or compensatory mitigation of direct effects on occupied habitats could reduce impacts.
Riverside cuckoo wasp	*Hedychridium argenteum*	CA-S1	Endemic to California where it is known only from eastern Riverside County in Sonoran Desert scrub, creosotebush scrub, yucca and cholla cactus, saltbush, and desert dune communities. Nearest recorded occurrence is 33 mi south of the SEZ. About 2,687,147 acres of potentially suitable habitat occurs within the SEZ region.	60,300 acres of potentially suitable habitat lost (2.2% of available habitat)	158,026 acres of potentially suitable habitat (5.9% of available habitat)	Moderate overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance of occupied habitats on the SEZ or compensatory mitigation of direct effects on occupied habitats could reduce impacts.

TABLE 9.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Reptiles						
Desert tortoise	***Gopherus agassizii***	ESA-T; CA-T; CA-S2	Mojave and Sonoran Deserts in desert creosote bush communities on firm soils for digging burrows, along riverbanks, washes, canyon bottoms, creosote flats, and desert oases. Nearest CNDDB occurrences are 10 mi (16 km) southwest of the SEZ, but designated critical habitat within the Chemehuevi DWMA exists adjacent to the northern boundary of the SEZ within the area of indirect effects. About 4,376,963 acres of potentially suitable habitat occurs within the SEZ region.	86,823 acres of potentially suitable habitat lost (2.0% of available habitat)	248,196 acres of potentially suitable habitat (5.7% of available habitat)	Moderate overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance of occupied habitats on the SEZ; translocation of individuals from areas of direct effects; or compensatory mitigation of direct effects on occupied habitats could reduce impacts. The potential for impact and need for mitigation should be determined in consultation with the USFWS and CDFG.

TABLE 9.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Reptiles (Cont.)						
Mojave fringe-toed lizard	***Uma scoparia***	BLM-S; CA-SC	Sandy habitats in the Mojave Desert from Death Valley south to the Colorado River near Blythe, California, and extreme western Arizona. Sparsely vegetated desert areas with fine windblown sand, including dunes, flats, and washes at elevations below 3,000 ft. Known to occur on the SEZ and in the affected area. About 3,205,349 acres of potentially suitable habitat occurs within the SEZ region.	42,102 acres of potentially suitable habitat lost (1.3% of available habitat)	151,467 acres of potentially suitable habitat (4.7% of available habitat)	Moderate overall impact. Avoiding or minimizing disturbance of desert dunes and sand transport systems or washes could reduce impacts. In addition, pre-disturbance surveys and avoiding or minimizing disturbance of occupied habitats on the SEZ or compensatory mitigation of direct effects could reduce impacts.

TABLE 9.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c] Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c] Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Birds						
Bendire's thrasher	***Toxostoma bendirei***	BLM-S; CA-SC	Summer resident in localized areas throughout the region in a variety of desert habitats with fairly large shrubs or cacti and open ground, or open woodland with scattered shrubs and trees, between 0 and 550 m elevation. Nearest recorded occurrences are 3 mi east of the SEZ within the area of indirect effects. Suitable habitat exists on the site. About 2,908,797 acres of potentially suitable habitat occurs within the SEZ region.	60,091 acres of potentially suitable habitat lost (2.1% of available habitat)	157,331 acres of potentially suitable habitat (5.4% of available habitat)	Moderate overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance of occupied habitats on the SEZ or compensatory mitigation of direct effects on occupied habitats could reduce impacts.
Ferruginous hawk	*Buteo regalis*	BLM-S; FWS-SC	Winter resident in the SEZ region in open grasslands, sagebrush flats, desert scrub, desert valleys, and fringes of pinyon-juniper habitats. Known to occur in San Bernardino County, California, in the region of the SEZ. About 2,504,054 acres of potentially suitable foraging habitat may occur within the SEZ and throughout the affected area.	60,502 acres of potentially suitable habitat lost (2.4% of available habitat)	158,193 acres of potentially suitable habitat (6.3% of available habitat)	Moderate overall impact on foraging habitat only. Avoidance of direct impacts on all foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effects.

TABLE 9.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Birds (Cont.)						
Hepatic tanager	***Piranga flava***	CA-S1	Summer resident in SEZ region in open coniferous forests, montane pine-oak forests, riparian woodlands, and pine savanna. Nests high in coniferous or deciduous trees. Nearest recorded occurrences are within 5 mi from the SEZ within the area of indirect effects. About 22,181 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	72 acres of potentially suitable habitat (0.3% of available habitat)	Small overall impact; no direct impact. No species-specific mitigation is warranted.
Western burrowing owl	*Athene cunicularia hypugaea*	BLM-S; CA-SC; CA-S2	Year-round resident within the SEZ region. Open areas with short sparse vegetation, including grasslands, agricultural fields, and disturbed areas. Nests in burrows created by mammals or tortoises. Nearest recorded occurrence is 35 mi southeast of the SEZ. About 4,749,768 acres of potentially suitable habitat occurs within the SEZ region.	40,772 acres of potentially suitable habitat lost (0.9% of available habitat)	251,180 acres of potentially suitable habitat (5.3% of available habitat)	Small overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance of occupied burrows and habitats in the area of direct effects or compensatory mitigation of direct effects on occupied habitats could reduce impacts.

TABLE 9.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Mammals						
Arizona myotis	*Myotis occultus*	CA-S2; CA-SC; FWS-SC	Colorado River lowlands and adjacent desert mountain ranges in ponderosa pine and oak-pine woodlands in close proximity to water and in riparian forests within desert areas along the Colorado River. Nearest recorded occurrences are 40 mi from of the SEZ. About 157,649 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	72 acres of potentially suitable habitat (<0.1% of available habitat)	Small overall impact; no direct impact. No species-specific mitigation is warranted.
California leaf-nosed bat	*Macrotus californicus*	BLM-S; CA-S2; CA-SC; FWS-SC	Year-round resident in SEZ region in desert riparian, desert wash, desert scrub, and palm oasis habitats at elevations below 2,000 ft. Roosts in mines, caves, and buildings. Nearest recorded occurrences are 20 mi north of the SEZ. About 4,097,122 acres of potentially suitable habitat occurs within the SEZ region.	83,272 acres of potentially suitable habitat lost (2.0% of available habitat)	242,454 acres of potentially suitable habitat (5.9% of available habitat)	Moderate overall impact on mostly foraging habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of discovered roost areas on the SEZ could reduce impacts.

TABLE 9.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Mammals (Cont.)						
Colorado Valley woodrat	*Neotoma albigula venusta*	CA-S1	Low-lying desert, creosote-mesquite, and pinyon-juniper habitats strongly influenced by the availability of den-building materials, including litter of cholla, prickly pear, mesquite, and catclaw. Nearest recorded occurrences are 40 mi from of the SEZ. About 1,726,493 acres of potentially suitable habitat occurs within the SEZ region.	11,342 acres of potentially suitable habitat lost (0.7% of available habitat)	15,882 acres of potentially suitable habitat (0.9% of available habitat)	Small overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance of occupied habitats on the SEZ or compensatory mitigation of direct effects on occupied habitats could reduce impacts.
Nelson's bighorn sheep	***Ovis canadensis nelsoni***	BLM-S; FWS-SC	Visually open, steep rocky terrain in mountainous habitats of the eastern Mojave and Sonoran Deserts in California. Rarely uses desert lowlands, except as corridors for travel between mountain ranges. Nearest recorded occurrences are from the Old Woman Mountains Wilderness and the Turtle Mountains Wilderness, within 3 mi northwest and east of the SEZ, respectively. About 2,568,543 acres of potentially suitable habitat occurs within the SEZ region.	16,975 acres of potentially suitable habitat lost (0.7% of available habitat)	33,000 acres of potentially suitable habitat (1.3% of available habitat)	Small overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance of occupied habitats within the SEZ and habitats that serve as movement corridors could further reduce impacts.

TABLE 9.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Mammals (Cont.)						
Pallid bat	*Antrozous pallidus*	BLM-S; CA-SC; FWS-SC	Year-round resident in the SEZ region in low-elevation desert communities, including grasslands, shrublands, and woodlands. Roosts in caves, crevices, and mines. Nearest recorded occurrence is from Cadiz Lake, approximately 10 mi northwest of the SEZ. About 3,972,586 acres of potentially suitable habitat occurs within the SEZ region.	69,782 acres of potentially suitable habitat lost (1.8% of available habitat)	230,823 acres of potentially suitable habitat (5.8% of available habitat)	Moderate overall impact on mostly foraging habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of discovered roost areas on the SEZ could reduce impacts.
Townsend's big-eared bat	*Corynorhinus townsendii*	BLM-S; CA-SC; CA-S2; FWS-SC	Year-round resident in the SEZ region in all habitats but subalpine and alpine habitats. Roosts in caves, mines, tunnels, buildings, or other human-made structures. Nearest recorded occurrence is approximately 25 mi from the SEZ. About 5,026,540 acres of potentially suitable habitat occurs within the SEZ region.	106,522 acres of potentially suitable habitat lost (2.1% of available habitat)	251,169 acres of potentially suitable habitat (5.0% of available habitat)	Moderate overall impact on mostly foraging habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of discovered roost areas on the SEZ could reduce impacts.

TABLE 9.2.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Western mastiff bat	*Eumops perotis californicus*	BLM-S; CA-SC; FWS-SC	Year-round resident in the SEZ region in many open semiarid habitats, including conifer and deciduous woodlands, shrublands, grasslands, chaparral, and urban areas. Roosts in crevices in cliff faces, buildings, and tall trees. Nearest recorded occurrence is near the Colorado River, approximately 30 mi east of the SEZ. About 4,589,512 acres of potentially suitable habitat occurs within the SEZ region.	106,522 acres of potentially suitable habitat lost (2.3% of available habitat)	251,169 acres of potentially suitable habitat (5.5% of available habitat)	Moderate overall impact on mostly foraging habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of discovered roost areas on the SEZ could reduce impacts.

[a] BLM-S = listed as a sensitive species by the BLM; CA-S1 = ranked as S1 in the State of California; CA-S2 = ranked as S2 in the State of California; CA-T = listed as threatened by the State of California; ESA-T = listed as threatened under the ESA; FWS-SC = USFWS species of concern. An asterisk denotes that the listing status applies to populations only within the State of Arizona.

[b] For plant and invertebrate species, potentially suitable habitat was determined by using CAReGAP and SWReGAP land cover types. For reptile, bird, and mammal species, potentially suitable habitat was determined by using CAReGAP and SWReGAP habitat suitability models as well as CAReGAP and SWReGAP land cover models. Area of potentially suitable habitat land cover for each species is presented for the SEZ region, defined as the area within 50 mi (80 km) of the SEZ center.

[c] Maximum area of potentially suitable habitat that could be affected relative to availability within the SEZ region. Habitat availability for each species within the region was determined by using CAReGAP and SWReGAP habitat suitability and land cover models. This approach probably overestimates the amount of suitable habitat in the project area. Impacts of access road and transmission line construction, upgrade, or operation are not assessed in this evaluation because of the proximity of existing infrastructure to the SEZ.

Footnotes continued on next page.

TABLE 9.2.12.2.-1 (Cont.)

[d] Direct effects within the SEZ consist of the ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations.

[e] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary. Indirect effects include effects from surface runoff, dust, noise, lighting, and so on from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance away from the SEZ.

[f] Overall impact magnitude categories were based on professional judgment and are as follows: (1) *small*: ≤1% of the population or its habitat would be lost and the activity would not result in a measurable change in carrying capacity or population size in the affected area; (2) *moderate*: >1 but ≤10% of the population or its habitat would be lost and the activity would result in a measurable but moderate (not destabilizing) change in carrying capacity or population size in the affected area; (3) *large*: >10% of a population or its habitat would be lost and the activity would result in a large, measurable, and destabilizing change in carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects because those effects would be difficult to mitigate. Programmatic design features would reduce most indirect effects to negligible levels.

[g] Species-specific mitigations are suggested here, but final mitigations should be developed in consultation with state and federal agencies and should be based on pre-disturbance surveys.

[h] To convert ft to m, multiply by 0.3048.

[i] To convert mi to km, multiply by 1.609.

[j] To convert acres to km^2, multiply by 0.004047.

[k] Species in bold text have been recorded or have designated critical habitat in the affected area.

9.2.12.1.1 Species Listed under the ESA That Could Occur in the Affected Area

In scoping comments on the proposed Iron Mountain SEZ, the USFWS expressed concern for impacts of project facilities on the desert tortoise, a species listed as threatened under the ESA in the state of California (Stout 2009). The desert tortoise is also listed as a threatened species under the CESA. This species has the potential to occur within the SEZ on the basis of observed occurrences near the SEZ, designated critical habitat within the area of indirect effects, and the presence of apparently suitable habitat in the SEZ (Figure 9.2.12.1-1; Table 9.2.12.1-1). Appendix J provides basic information on life history, habitat needs, and threats to populations of this species.

The desert tortoise occurs in the Chemehuevi DWMA, which is adjacent to the northern boundary of the proposed Iron Mountain SEZ within the area of indirect effects. In 2007, surveys for desert tortoises were conducted by the USFWS Desert Tortoise Recovery Office in the Chemehuevi DWMA, in an area adjacent to the proposed Iron Mountain SEZ (Stout 2009). On the basis of these survey results, USFWS estimated a desert tortoise density of about 5 individuals/km^2 within the 997,808-acre (4,038-km^2) DWMA. The USFWS judged that overall mean density within the SEZ would be less than in the DWMA because much of the SEZ is at very low elevation, and implied that the SEZ may support several hundred to more than 1,000 desert tortoises.

The CNDDB does not have recorded occurrences of the desert tortoise on the SEZ or within the area of indirect effects. However, CAReGAP predicts the presence of potentially suitable habitat for the species on the SEZ and throughout the area of indirect effects (Figure 9.2.12.1-1; Table 9.2.12.1-1). Of this potentially suitable habitat area, the USGS desert tortoise model (Nussear et al. 2009) identifies approximately 20,000 acres (80 km^2) of highly suitable habitat (modeled suitability value $\geq$0.8 out of 1) in the eastern portion of the SEZ. The desert tortoise is also known to occur as near as 10 mi (16 km) southwest of the Iron Mountain SEZ between the Joshua Tree and Palen-McCoy WAs (Figure 9.2.12.1-1).

Designated critical habitat for this species does not occur on the SEZ, but adjacent critical habitat occurs north of the SEZ in the area of indirect effects within the Chemehuevi DWMA. The Iron Mountain SEZ is situated between the Chemehuevi (to the north) and Pinto Mountains (to the southwest) and Chuckwalla Critical Habitat units (Figure 9.2.12-1); therefore, the SEZ may provide important connectivity between these two critical habitat units.

9.2.12.1.2 BLM-Designated Sensitive Species

There are 15 BLM-designated sensitive species that may occur in the affected area of the Iron Mountain SEZ (Table 9.2.12.1-1). These BLM-designated sensitive species include the following: (1) plants—chaparral sand-verbena, Harwood's eriastrum, Howe's hedgehog cactus, Munz's cholla, Orocopia sage, and white-margined beardtongue; (2) reptiles—Mojave fringe-toed lizard; (3) birds—Bendire's thrasher, ferruginous hawk, and western burrowing owl; and (4) mammals—California leaf-nosed bat, Nelson's bighorn sheep, pallid bat, Townsend's big-eared bat, and western mastiff bat. Of these species, Harwood's eriastrum, Mojave fringe-toed lizard, Bendire's thrasher, and Nelson's bighorn sheep have been recorded in the affected area. Habitats in which these species are found, the amount of potentially suitable habitat in the affected area, and known locations of the species relative to the SEZ are discussed below and presented in Table 9.2.12.1-1. Additional life history information for these species is provided in Appendix J.

Chaparral Sand-Verbena

The chaparral sand-verbena is an annual forb herb endemic to southern California. It historically occurred on and in the vicinity of the SEZ, but it is currently known to occur only in Riverside and Orange Counties outside of the area of indirect effects. Although the species has not been recently recorded on the SEZ, according to the CAReGAP land cover model, potentially suitable sand dune habitat still occurs on the SEZ and in other portions of the affected area (Table 9.2.12.1-1).

Harwood's Eriastrum

The Harwood's eriastrum is an annual forb known only from the eastern Mojave Desert in southern California. This species is known to occur on the SEZ. According to the CAReGAP land cover model, potentially suitable desert sand dune habitat occurs on the SEZ and in other portions of the affected area (Table 9.2.12.1-1).

Howe's Hedgehog Cactus

The Howe's hedgehog cactus is a short stout cactus endemic to southern California where it is currently known from two extant occurrences near Needles, California, approximately 45 mi (72 km) north of the SEZ. Populations are not known to occur on the SEZ. According to the CAReGAP land cover model, potentially suitable Mojavean desert scrub habitat may occur on the SEZ and in other portions of the affected area (Table 9.2.12.1-1).

Munz's Cholla

The Munz's cholla is a tree-like cactus endemic to southern California where it is known only from the Chocolate Mountains in Imperial and Riverside Counties as near as 50 mi (80 km) south of the SEZ. The species inhabits Sonoran Desert creosotebush scrub communities. The species is not known to occur on the SEZ. According to the CAReGAP land cover model, potentially suitable habitat occurs on the SEZ and in other portions of the affected area (Table 9.2.12.1-1).

Orocopia Sage

The Orocopia sage is a flowering evergreen shrub endemic to southern California in dry desert washes and floodplains. The species is known to occur as near as 33 mi (53 km) southwest of the SEZ. According to the CAReGAP land cover model, potentially suitable desert scrub habitat for the species occurs on the SEZ and in other portions of the affected area (Table 9.2.12.1-1).

White-Margined Beardtongue

The white-margined beardtongue is a perennial forb that inhabits desert scrub habitats in southeastern California and Arizona. The species is known in California from fewer than 20 occurrences. Populations are known to occur as near as 25 mi (40 km) northwest of the SEZ. According to the CAReGAP land cover model, potentially suitable habitat for the species may occur on the SEZ and in other portions of the affected area (Table 9.2.12.1-1).

Mojave Fringe-Toed Lizard

The Mojave fringe-toed lizard is a fairly small smooth-skinned lizard that inhabits desert sand dune habitats in southeastern California and western Arizona. The species occurs as scattered populations in specialized dune habitats composed of fine, loose, wind-blown sand deposits. The species is known to occur on the SEZ and in portions of the area of indirect effects. According to the CAReGAP habitat suitability model, potentially suitable habitat for this species occurs on the SEZ and in other portions of the affected area (Table 9.2.12.1-1).

Bendire's Thrasher

The Bendire's thrasher is a small neotropical migrant bird that is a summer breeding resident in southern California. This species inhabits desert succulent shrub and Joshua tree (*Yucca brevifolia*) habitats in the Mojave Desert, where it is associated with sagebrush (*Artemisia* sp.), pinyon-juniper woodlands, cholla (*Opuntia* sp.) cactus, Joshua tree, palo verde (*Cercidium* sp.), mesquite (*Prosopis* sp.), and agave species. Nearest recorded occurrences are 3 mi (5 km) east of the SEZ. According to the CAReGAP land cover model, Mojave Desert scrub habitats that may be potentially suitable foraging or nesting habitat occurs on the SEZ and in other portions of the affected area (Table 9.2.12.1-1).

Ferruginous Hawk

The ferruginous hawk is a winter resident and migrant in the Iron Mountain SEZ region. The species' winter range includes the entire SEZ region. The species inhabits open grasslands, sagebrush flats, desert scrub, and the fringes of pinyon-juniper woodlands. This species is known to occur in the SEZ region in Riverside County, California, and according to the CAReGAP land cover model, potentially suitable foraging habitat occurs on the SEZ and in other portions of the SEZ region (Table 9.2.12.1-1).

Western Burrowing Owl

The western burrowing owl is a year-round resident of open, dry grasslands and desert habitats in southern California and Arizona. Populations occur locally in open areas with sparse vegetation. Nearest recorded occurrences are 35 mi (56 km) southeast of the SEZ. According to the CAReGAP habitat suitability model, potentially suitable habitat occurs on the SEZ and in other portions of the affected area (Table 9.2.12.1-1). The availability of nest sites (burrows) within the affected area has not been determined; shrubland habitat that may be suitable for either foraging or nesting occurs throughout the affected area.

California Leaf-Nosed Bat

The California leaf-nosed bat is a large-eared bat with a leaflike flap of protective skin on the tip of its nose. It primarily occurs along the Colorado River from southern Nevada, through Arizona and California, to Baja, California, and Sinaloa, Mexico. The species forages in a variety of desert habitats including desert riparian, desert wash, desert scrub, and palm oasis. It roosts in caves, crevices, and mines. Nearest recorded occurrences are 20 mi (32 km) north of the SEZ. According to the CAReGAP land cover model, potentially suitable habitat may occur on the SEZ and in other portions of the affected area (Table 9.2.12.1-1). The potentially suitable habitat on the SEZ and in the area of indirect effects could include foraging and roosting habitat. On the basis of an evaluation of land cover types, approximately 10,000 acres (40 km^2) and 76,000 acres (308 km^2) of rocky cliffs and outcrops on the SEZ and in the area of direct effects, respectively, could be potentially suitable roosting habitat for this species.

Nelson’s Bighorn Sheep

The Nelson’s bighorn sheep is one of several subspecies of bighorn sheep known to occur in the southwestern United States. This species occurs in desert mountain ranges in Arizona, California, Nevada, Oregon, and Utah. The Nelson’s bighorn sheep uses primarily montane shrubland, forest, and grassland habitats and may utilize desert valleys as corridors for travel between range habitats. In California, the species is known from the desert mountain ranges from the White Mountains, south to the San Bernardino Mountains, and southeastward to the Mexican border. Nearest recorded occurrences are from the Old Woman Mountains Wilderness and the Turtle Mountains Wilderness within 3 mi (5 km) northwest and east of the SEZ, respectively. According to the CAReGAP habitat suitability model, the SEZ and other portions of the affected area may provide important habitat for sheep travelling between these two ranges (Table 9.2.12.1-1). This species may utilize portions of the SEZ as migratory habitat between the Coxcomb, Old Woman, and Turtle Mountains.

Pallid Bat

The pallid bat is a large pale bat with large ears locally common in desert grasslands and shrublands in the southwestern United States. It roosts in caves, crevices, and mines. The species is a year-round resident throughout southern California. The nearest recorded occurrence is from Cadiz Lake, approximately 10 mi (16 km) northwest of the SEZ. According to the CAReGAP land cover model, potentially suitable habitat may occur on the SEZ and in other portions of the affected area (Table 9.2.12.1-1). The potentially suitable habitat on the SEZ and in the area of indirect effects could include foraging and roosting habitat. On the basis of an evaluation of land cover types, approximately 10,000 acres (40 km^2) and 76,000 acres (308 km^2) of rocky cliffs and outcrops on the SEZ and in the area of direct effects, respectively, could be potentially suitable roosting habitat for this species.

Townsend's Big-Eared Bat

The Townsend's big-eared bat is widely distributed throughout the western United States. In California, the species forages year-round in a wide variety of desert and non-desert habitats. The species roosts in caves, mines, tunnels, buildings, and other man-made structures. Nearest recorded occurrences are approximately 25 mi (40 km) from the SEZ. According to the CAReGAP land cover model, potentially suitable habitat may occur on the SEZ and in other portions of the affected area (Table 9.2.12.1-1). The potentially suitable habitat on the SEZ and in the area of indirect effects could include foraging and roosting habitat. On the basis of an evaluation of land cover types, approximately 10,000 acres (40 km^2) and 76,000 acres (308 km^2) of rocky cliffs and outcrops on the SEZ and in the area of direct effects, respectively, could be potentially suitable roosting habitat for this species.

Western Mastiff Bat

The western mastiff bat is a large uncommon resident of southern California and western Arizona. The species forages in many open semiarid habitats including conifer and deciduous woodlands, shrublands, grassland, and urban areas. It roosts in crevices, trees, and buildings. Nearest recorded occurrences are from the Colorado River, approximately 30 mi (48 km) east of the SEZ. According to the CAReGAP land cover model, potentially suitable habitat may occur on the SEZ and in other portions of the affected area (Table 9.2.12.1-1). The potentially suitable habitat on the SEZ and in the area of indirect effects could include suitable foraging and roosting habitat. On the basis of an evaluation of land cover types, approximately 10,000 acres (40 km^2) and 76,000 acres (308 km^2) of rocky cliffs and outcrops on the SEZ and in the area of direct effects, respectively, could be potentially suitable roosting habitat for this species.

9.2.12.1.3 State-Listed Species

The desert tortoise is the only species listed by the State of California that may occur in the Iron Mountain SEZ affected area (Table 9.2.12.1-1). This species is listed as threatened under the CESA; it is also listed as threatened under the ESA and is previously discussed in Section 9.2.12.1.1.

9.2.12.1.4 Rare Species

There are 42 species that have a state rank of S1 or S2 in California or that are considered species of concern by the State of California or USFWS that may occur in the affected area of the Iron Mountain SEZ (Table 9.2.12.1-1). Of these species, there are 27 that have not been discussed as ESA-listed (Section 9.2.12.1.1), BLM-designated sensitive (Section 9.2.12.1.2), or state-listed (Section 9.2.12.1.3).

9.2.12.2 Impacts

The potential for impacts on special status species from utility-scale solar energy development within the proposed Iron Mountain SEZ is discussed in this section. The types of impacts that special status species could incur from construction and operation of utility-scale solar energy facilities are discussed in Section 5.10.4.

The assessment of impacts on special status species is based on available information on the presence of species in the affected area as presented in Section 9.2.12.1 following the analysis approach described in Appendix M. It is assumed that, prior to development, surveys would be conducted to determine the presence of special status species and their habitats in and near areas where ground-disturbing activities would occur. Additional NEPA assessments, ESA consultations, and coordination with state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid, minimize, or mitigate impacts on special status species (see Section 9.2.12.3).

Solar energy development within the Iron Mountain SEZ could affect a variety of habitats (see Section 9.2.10). These impacts on habitats could in turn affect special status species that are dependent on those habitats. Based on CNDDB records and information provided by the CDFG and USFWS, there are five special status species known to occur within the affected area of the Iron Mountain SEZ: Harwood’s eriastrum, Mojave fringe-toed lizard, Bendire’s thrasher, hepatic tanager, and Nelson’s bighorn sheep. In addition, designated critical habitat for the desert tortoise occurs within the affected area adjacent to the SEZ boundary. These species are listed in bold in Table 9.2.12.1-1. Other special status species may occur on the SEZ or within the affected area based upon the presence of potentially suitable habitat. As discussed in Section 9.2.12.1, this approach to identifying the species that could occur in the affected area probably overestimates the number of species that actually occur in the affected area, and may therefore overestimate impacts on some special status species.

Potential direct and indirect impacts on special status species within the SEZ and in the area of indirect effect outside the SEZ are presented in Table 9.2.12.1-1. In addition, the overall potential magnitude of impacts on each species (assuming design features are in place) is presented along with any potential species-specific mitigation measures that could further reduce impacts.

Impacts on special status species could occur during all phases of development (construction, operation, and decommissioning and reclamation) of a utility-scale solar energy project within the SEZ. Construction and operation activities could result in short- or long-term impacts on individuals and their habitats, especially if these activities are sited in areas where special status species are known to or could occur. As presented in Section 9.2.1.2, impacts of access road and transmission line construction, upgrade, or operation are not assessed in this evaluation because of the proximity of existing infrastructure to the SEZ.

Direct impacts would result from habitat destruction or modification. It is assumed that direct impacts would occur only within the SEZ where ground-disturbing activities are expected to occur. Indirect impacts could result from surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, accidental spills, harassment, and lighting. No ground-disturbing activities associated with project development are anticipated to occur within the area of indirect effects. Decommissioning of facilities and reclamation of disturbed areas after operations cease could result in short-term negative impacts on individuals and habitats adjacent to project areas, but long-term benefits would accrue if original land contours and native plant communities were restored in previously disturbed areas.

The successful implementation of programmatic design features (discussed in Appendix A, Section A.2.2) would reduce direct impacts on some special status species, especially those that depend on habitat types that can be easily avoided (e.g., dunes and sand transport systems, playa and desert wash habitats). Indirect impacts on special status species could be reduced to negligible levels by implementing programmatic design features, especially those engineering controls that would reduce runoff, sedimentation, spills, and fugitive dust.

9.2.12.2.1 Impacts on Species Listed under the ESA

The desert tortoise is the only species listed under the ESA that has the potential to occur in the affected area of the proposed Iron Mountain SEZ and is the only ESA-listed species that the USFWS identified as potentially affected by solar energy development on the Iron Mountain SEZ (Stout 2009). The tortoise is known to occur in the Chemehuevi DWMA adjacent to the northern boundary of the SEZ in the area of indirect effects; populations are also known to occur south of the SEZ near the Pinto Mountains DWMA (Figure 9.2.12.1-1). According to the CAReGAP habitat suitability model, approximately 86,823 acres (351 km^2) of potentially suitable habitat for the desert tortoise could be directly affected by construction and operations of solar energy facilities on the SEZ (Table 9.2.12.1-1). This direct effects area represents about 2.0% of available suitable habitat of the desert tortoise in the SEZ region. Of this habitat, the USGS desert tortoise habitat suitability model (Nussear et al. 2009) identified the highest suitability in the eastern portion of the SEZ. About 248,196 acres (1,000 km^2) of suitable habitat occurs in the area of potential indirect effects; this area represents about 5.7% of the available suitable habitat in the SEZ region (Table 9.2.12.1-1).

On the basis of surveys of the desert tortoise conducted in the adjacent Chemehuevi DWMA, the USFWS estimated that full-scale solar energy facilities on the SEZ may directly affect between several hundred to more than 1,000 desert tortoises on the SEZ (Stout 2009). In addition to direct impacts, facilities on the SEZ could indirectly affect desert tortoises by fragmenting and degrading their adjacent habitat (refer to Section 5.10.4 for a discussion of possible indirect impacts). Fragmentation would be exacerbated by the installation of exclusionary fencing at the perimeter of the SEZ or individual project areas. The SEZ is situated between the Chemehuevi and Pinto Mountains DWMAs (these DWMAs also contain USFWS-designated critical habitat), and terrestrial habitats within the SEZ may provide important linkages between the DWMAs. Therefore, facilities on the SEZ may disrupt desert tortoise population dynamics in nearby DWMAs and designated critical habitat.

The overall impact on the desert tortoise from construction, operation, and decommissioning of utility-scale solar energy facilities within the Iron Mountain SEZ is considered moderate, because the amount of potentially suitable habitat for this species in the area of direct effects represents between 1% and 10% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features alone is unlikely to substantially reduce these impacts. Avoidance of all potentially suitable habitats for this species is not a feasible means of mitigating impacts, because these habitats (desert scrub) are widespread throughout the area of direct effects.

Development of actions to reduce impacts (e.g., reasonable and prudent alternatives, reasonable and prudent measures, and terms and conditions) for the desert tortoise, including a survey protocol, avoidance measures, minimization measures, and, potentially, translocation actions, and compensatory mitigation, would require consultations formal consultation with the USFWS under Section 7 of the ESA. These consultations may be used to authorize incidental take statements per Section 10 of the ESA (if necessary). In addition, the CESA provides authority to the CDFG to regulate potential impacts on the desert tortoise and other species listed under the CESA. Therefore, formal consultation with the CDFG also would be required to permit the incidental take of desert tortoises in the SEZ.

There are inherent dangers to tortoises associated with their capture, handling, and translocation from the SEZ. These actions, if done improperly, can result in injury or death. To minimize these risks (and as stated above), the desert tortoise translocation plan should be developed in consultation with the USFWS and the CDFG and follow the *Guidelines for Handling Desert Tortoises During Construction Projects* (Desert Tortoise Council 1994) and other current translocation guidance provided by the USFWS and CDFG. Consultation will identify potentially suitable recipient locations, density thresholds for tortoise populations in recipient locations, procedures for pre-disturbance clearance surveys and tortoise handling, as well as disease testing and post-translocation monitoring and reporting requirements. Despite some risk of mortality or decreased fitness, translocation is widely accepted as a useful strategy for the conservation of the desert tortoise (Field et al. 2007).

To offset impacts of solar development on the SEZ, compensatory mitigation may be needed to balance the acreage of habitat lost with acquisition of lands that would be improved and protected for desert tortoise populations (USFWS 1994). Compensation can be accomplished by improving the carrying capacity for the desert tortoise on the acquired lands. Other mitigation actions may include funding for the habitat enhancement of the desert tortoise on existing federal lands. Consultations with the USFWS and CDGF would be necessary to determine the appropriate mitigation ratio to acquire, enhance, and preserve desert tortoise compensation lands.

9.2.12.2.2 Impacts on BLM-Designated Sensitive Species

Impacts on the 15 BLM-designated sensitive species that have potentially suitable habitat within the SEZ (i.e., the area of direct effect) are discussed below.

Chaparral Sand-Verbena

The chaparral sand-verbena historically occurred on and in the vicinity of the SEZ, but it is currently known to occur only as near as Riverside County, California, outside of the area of indirect effects. According to the CAReGAP land cover model, approximately 209 acres (1 km^2) of potentially suitable desert sand dune habitat within the SEZ may be directly affected by project construction and operations (Table 9.2.12.1-1). This direct impact area represents 0.3% of available suitable habitat in the SEZ region. About 695 acres (3 km^2) of potentially suitable habitat occurs within the area of indirect effects; this area represents about 1.1% of the available suitable habitat in the SEZ region (Table 9.2.12.1-1).

The overall impact on the chaparral sand-verbena from construction, operation, and decommissioning of utility-scale solar energy facilities within the Iron Mountain SEZ is considered small, because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in SEZ region. The implementation of programmatic design features would reduce indirect impacts to negligible levels.

Chaparral sand-verbena habitat (desert sand dunes) occurs in a limited portion of the SEZ and could be avoided during the development of facilities and protected from indirect effects. Avoiding or minimizing disturbance to occupied habitats and dunes and sand transport systems would further reduce impacts on this species. If avoidance or minimization is not feasible, plants could be translocated from the area of direct effects to protected areas that would not be affected directly or indirectly by future development. Alternatively, or in combination with translocation, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or more of these options could be designed to completely offset the impacts of development. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Harwood's Eriastrum

The Harwood's eriastrum is known to occur on and in the vicinity of the Iron Mountain SEZ. According to the CAReGAP land cover model, approximately 209 acres (1 km^2) of suitable desert sand dune habitat on the SEZ could be directly affected by construction and operations (Table 9.2.12.1-1). This direct impact area represents about 0.3% of available suitable habitat in the SEZ region. About 695 acres (3 km^2) of suitable habitat occurs in the area of potential indirect effects; this area represents about 1.1% of the available suitable habitat in the SEZ region (Table 9.2.12.1-1).

The overall impact on the Harwood's eriastrum from construction, operation, and decommissioning of utility-scale solar energy facilities within the Iron Mountain SEZ is considered small, because the amount of potentially suitable habitat for this species in the area of direct effects represents <1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to reduce indirect impacts to negligible levels.

Harwood's eriastrum habitat (desert sand dunes) occupies a limited portion of the SEZ and could be avoided during solar development and protected from indirect effects. Avoiding or minimizing disturbance to occupied habitats and dunes and sand transport systems, and the mitigation measures described previously for the chaparral sand-verbena, could further reduce impacts on this species.

Howe's Hedgehog Cactus

The Howe's hedgehog cactus is not known to occur in the affected area of the Iron Mountain SEZ; however, according to the CAReGAP land cover model, approximately 60,091 acres (243 km^2) of potentially suitable desert scrub habitat on the SEZ could be directly affected by construction and operations (Table 9.2.12.1-1). This direct impact area represents 2.4% of available suitable habitat in the SEZ region. About 157,331 acres (637 km^2) of potentially suitable habitat occurs in the area of potential indirect effects; this area represents about 6.2% of the available suitable habitat in the SEZ region (Table 9.2.12.1-1).

The overall impact on the Howe's hedgehog cactus from construction, operation, and decommissioning of utility-scale solar energy facilities within the Iron Mountain SEZ is considered moderate, because the amount of potentially suitable habitat for this species in the area of direct effects represents more than 1% but less than 10% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to reduce indirect impacts to negligible levels.

The avoidance of all potentially suitable habitats is not a feasible way to mitigate impacts on the Howe's hedgehog cactus, because these habitats (mostly desert scrub) are widespread throughout the area of direct effects. However, the implementation of mitigation options described previously for the chaparral sand-verbena could reduce impacts on this species.

Munz's Cholla

The Munz's cholla is not known to occur in the affected area of the Iron Mountain SEZ. According to the CAReGAP land cover model, however, approximately 82,271 acres (333 km^2) of potentially suitable desert scrub and wash habitats on the SEZ could be directly affected by construction and operations (Table 9.2.12.1-1). This direct impact area represents about 1.9% of available suitable habitat in the SEZ region. About 244,144 acres (988 km^2) of potentially suitable habitat occurs in the area of potential indirect effects; this area represents about 5.5% of the available suitable habitat in the SEZ region (Table 9.2.12.1-1).

The overall impact on the Munz's cholla from construction, operation, and decommissioning of utility-scale solar energy facilities within the Iron Mountain SEZ is considered moderate, because the amount of potentially suitable habitat for this species in the area of direct effects represents more than 1% but less than 10% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to reduce indirect impacts to negligible levels.

Avoidance of all potentially suitable habitats to mitigate impacts on the Munz's cholla is not feasible, because these habitats (mostly desert scrub) are widespread throughout the area of direct effects. However, the implementation of mitigation options described previously for the chaparral sand-verbena could reduce impacts on this species.

Orocopia Sage

The Orocopia sage is not known to occur in the affected area of the Iron Mountain SEZ. According to the CAReGAP land cover model, however, approximately 72,042 acres (333 km^2) of potentially suitable desert scrub and wash habitats on the SEZ could be directly affected by construction and operations (Table 9.2.12.1-1). This direct impact area represents about 2.5% of available suitable habitat in the SEZ region. About 168,222 acres (680 km^2) of potentially suitable habitat occurs in the area of potential indirect effects; this area represents about 5.9% of the available suitable habitat in the SEZ region (Table 9.2.12.1-1).

The overall impact on the Orocopia sage from construction, operation, and decommissioning of utility-scale solar energy facilities within the Iron Mountain SEZ is considered moderate, because the amount of potentially suitable habitat for this species in the area of direct effects represents more than 1% but less than 10% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to reduce indirect impacts to negligible levels.

Avoidance of all potentially suitable habitats to mitigate impacts on the Orocopia sage is not feasible, because potentially suitable desert scrub habitats are widespread throughout the area of direct effects. However, the implementation of mitigation options described previously for the chaparral sand-verbena could reduce impacts on this species.

White-Margined Beardtongue

The white-margined beardtongue is not known to occur in the affected area of the Iron Mountain SEZ. According to the CAReGAP land cover model, however, approximately 60,300 acres (244 km^2) of potentially suitable desert scrub and dune habitats on the SEZ could be directly affected by construction and operations (Table 9.2.12.1-1). This direct impact area represents about 2.3% of available suitable habitat in the SEZ region. About 158,026 acres (640 km^2) of potentially suitable habitat occurs in the area of potential indirect effects; this area represents about 6.1% of the available suitable habitat in the SEZ region (Table 9.2.12.1-1).

The overall impact on the white-margined beardtongue from construction, operation, and decommissioning of utility-scale solar energy facilities within the Iron Mountain SEZ is considered moderate, because the amount of potentially suitable habitat for this species in the area of direct effects represents more than 1% but less than 10% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to reduce indirect impacts to negligible levels.

Avoidance of all potentially suitable habitats to mitigate impacts on the white-margined beardtongue is not feasible, because potentially suitable desert scrub habitats are widespread throughout the area of direct effect. However, the implementation of mitigation options described previously for the chaparral sand-verbena could reduce impacts on this species.

Mojave Fringe-Toed Lizard

The Mojave fringe-toed lizard is known to occur on and in the vicinity of the Iron Mountain SEZ in specialized desert dune habitats within desert scrub communities. According to the CAReGAP habitat suitability model, approximately 42,102 acres (170 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 9.2.12.1-1). This direct impact area represents about 1.3% of available suitable foraging habitat in the SEZ region. About 151,467 acres (613 km^2) of potentially suitable foraging habitat occurs in the area of potential indirect effects; this area represents about 4.7% of the available suitable habitat in the SEZ region (Table 9.2.12.1-1).

The overall impact on the Mojave fringe-toed lizard from construction, operation, and decommissioning of utility-scale solar energy facilities within the Iron Mountain SEZ is considered moderate, because the amount of potentially suitable habitat for this species in the area of direct effects represents more than 1% but less than 10% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to reduce indirect impacts to negligible levels.

Although the Mojave fringe-toed lizard is dependent upon unique sandy habitats such as dunes, washes, and sand transport systems, these habitats may be localized and widespread throughout the Iron Mountain SEZ. Avoiding or minimizing disturbance to occupied habitats, dune and sand transport systems, and desert wash habitats would reduce impacts on this species. If avoidance or minimization is not feasible, impacts could be reduced by conducting pre-disturbance surveys and avoiding or minimizing impacts on occupied habitats on the SEZ. If avoidance or minimization is not feasible, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that uses one or both of these options could be designed to completely offset the impacts of development.

Bendire's Thrasher

The Bendire's thrasher is a summer resident in southern California and is known to occur within the affected area as near as 3 mi (5 km) east of the Iron Mountain SEZ. According to the CAReGAP land cover model, approximately 60,091 acres (243 km^2) of potentially suitable desert shrub-scrub and arid woodland habitats on the SEZ could be directly affected by construction and operations (Table 9.2.12.1-1). This direct impact area represents about 2.1% of available suitable habitat in the SEZ region. About 157,331 acres (637 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 5.4% of the available suitable habitat in the SEZ region (Table 9.2.12.1-1).

The overall impact on the Bendire's thrasher from construction, operation, and decommissioning of utility-scale solar energy facilities within the Iron Mountain SEZ is considered moderate, because the amount of potentially suitable habitat for this species in the area of direct effects represents more than 1% but less than 10% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to reduce indirect impacts to negligible levels.

Avoidance of all potentially suitable habitats to mitigate impacts on the Bendire's thrasher is not feasible, because potentially suitable desert scrub habitats are widespread throughout the area of direct effects. Impacts could be reduced by conducting pre-disturbance surveys and avoiding or minimizing disturbance to occupied and potentially suitable habitats on the SEZ, especially nesting habitats. If avoidance or minimization is not a feasible option, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that uses one or both of these options could be designed to completely offset the impacts of development.

Ferruginous Hawk

The ferruginous hawk is a winter resident in southern California within the Iron Mountain region. According to the CAReGAP land cover model, approximately 60,502 acres (245 km^2) of potentially suitable foraging habitat on the SEZ could be directly affected by construction and operations (Table 9.2.12.1-1). This direct impact area represents about 2.4% of available suitable habitat in the SEZ region. About 158,193 acres (640 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 6.3% of the available suitable habitat in the SEZ region (Table 9.2.12.1-1).

The overall impact on the ferruginous hawk from construction, operation, and decommissioning of utility-scale solar energy facilities within the Iron Mountain SEZ is considered moderate because the amount of this habitat in the area of direct effects represents more than 1% but less than 10% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels. Avoidance of direct impacts on all potentially suitable foraging habitat is not a feasible way to mitigate impacts on the ferruginous hawk because potentially suitable shrubland habitat is widespread throughout the area of direct effects and readily available in other portions of the affected area.

Western Burrowing Owl

The western burrowing owl is not known to occur in the affected area of the Iron Mountain SEZ. However, according to the CAReGAP habitat suitability model, approximately 40,772 acres (165 km^2) of potentially suitable desert scrub habitat on the SEZ could be directly affected by construction and operations (Table 9.2.12.1-1). This direct impact area represents about 0.9% of available suitable habitat in the SEZ region. About 251,180 acres (1,016 km^2) of potentially suitable habitat occurs in the area of potential indirect effects; this area represents about 5.3% of the available suitable habitat in the SEZ region (Table 9.2.12.1-1). Most of this area could serve as foraging and nesting habitat (shrublands). The abundance of burrows suitable for nesting on the SEZ and in the area of indirect effects has not been determined.

The overall impact on the western burrowing owl from construction, operation, and decommissioning of utility-scale solar energy facilities within the Iron Mountain SEZ is considered small, because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels.

Avoidance of all potentially suitable habitats is not feasible to mitigate impacts on the western burrowing owl because potentially suitable shrubland habitats are widespread throughout the area of direct effect and readily available in other portions of the SEZ region. However, impacts on the western burrowing owl could be reduced by avoiding or minimizing disturbance to occupied burrows and habitat in the area of direct effects. If avoidance or minimization of disturbance to all occupied habitat is not a feasible option, a compensatory mitigation plan could be developed and implemented to mitigate direct effects. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or both of these options could be designed to completely offset the impacts of development. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat within the area of direct effects.

California Leaf-Nosed Bat

The California leaf-nosed bat is a year-round resident in southern California within the Iron Mountain SEZ region. According to the CAReGAP land cover model, approximately 83,272 acres (337 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 9.2.12.1-1). This direct impact area represents about 2.0% of available suitable foraging habitat in the SEZ region. About 242,454 acres (981 km^2) of potentially suitable habitat occurs in the area of indirect effects; this area represents about 5.9% of the available suitable foraging habitat in the region (Table 9.2.12.1-1). The potentially suitable habitat on the SEZ is primarily foraging habitat (desert shrubland); however, suitable roosting habitat may occur on the SEZ. On the basis of an evaluation of land cover types, approximately 10,000 acres (40 km^2) of rocky cliffs and outcrops that may be potentially suitable roosting habitat occurs on the SEZ. An additional 76,000 acres (308 km^2) of rocky cliffs and outcrops occurs in the area of direct effects.

The overall impact on the California leaf-nosed bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the Iron Mountain SEZ is considered moderate, because the amount of potentially suitable habitat for this species in the area of direct effects represents more than 1% but less than 10% of potentially suitable foraging habitat in the SEZ region. The implementation of programmatic design features is expected to reduce indirect impacts to negligible levels.

Avoidance of direct impacts on all foraging habitat (shrublands) is not feasible because suitable foraging habitat (shrublands) is widespread in the area of direct effects and readily available in other portions of the affected area. However, avoiding or minimizing disturbance of all potentially suitable roosting habitat (rocky cliffs and outcrops) on the SEZ is feasible and could reduce impacts. If avoiding or minimizing disturbance of all occupied or suitable roosting habitat is not a feasible option, a compensatory mitigation plan could be developed and implemented to mitigate direct effects. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or both of these options could be designed to completely offset the impacts of development. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat within the area of direct effects.

Nelson's Bighorn Sheep

The Nelson's bighorn sheep is known to occur in the Old Woman Mountains Wilderness and Turtle Mountains Wilderness within the affected area of the SEZ, and the species may utilize habitats within the SEZ as migration corridors between ranges. According to the CAReGAP habitat suitability model, approximately 16,975 acres (69 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 9.2.12.1-1). This direct impact area represents about 0.7% of available suitable habitat in the SEZ region. About 33,000 acres (134 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 1.3% of the available suitable habitat in the SEZ region (Table 9.2.12.1-1).

The overall impact on the Nelson's bighorn sheep from construction, operation, and decommissioning of utility-scale solar energy facilities within the Iron Mountain SEZ is considered small, because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features may be sufficient to reduce indirect impacts on this species to negligible levels.

Impacts on the Nelson's bighorn sheep could be further reduced by conducting preconstruction surveys and avoiding or minimizing disturbance to all occupied or suitable habitats and important movement corridors on the SEZ. If avoidance or minimization is not a feasible option, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or both of these options could be designed to completely offset the impacts of development.

Pallid Bat

The pallid bat is a year-round resident in southern California within the Iron Mountain region. According to the CAReGAP land cover model, approximately 69,782 acres (282 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 9.2.12.1-1). This direct impact area represents about 1.8% of available suitable foraging habitat in the SEZ region. About 230,823 acres (934 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 5.8% of the available suitable foraging habitat in the SEZ region (Table 9.2.12.1-1). The potentially suitable habitat on the SEZ is primarily foraging habitat (desert shrubland); however, suitable roosting habitat may occur on the SEZ. On the basis of an evaluation of land cover types, approximately 10,000 acres (40 km^2) of rocky cliffs and outcrops that may be potentially suitable roosting habitat occurs on the SEZ. An additional 76,000 acres (308 km^2) of rocky cliffs and outcrops occurs in the area of direct effects.

The overall impact on the pallid bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the Iron Mountain SEZ is considered moderate, because the amount of potentially suitable habitat for this species in the area of direct effects represents more than 1% but less than 10% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to reduce indirect impacts to negligible levels.

Avoidance of direct impacts on all foraging habitat (shrublands) is not feasible because suitable foraging habitat (shrublands) is widespread in the area of direct effects and readily available in other portions of the affected area. However, avoiding or minimizing disturbance of all potential roosting habitat (rocky cliffs and outcrops) on the SEZ is feasible and could reduce impacts. If avoidance or minimization of disturbance to all occupied or suitable roosting habitat is not a feasible option, a compensatory mitigation plan could be developed and implemented to mitigate direct effects. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or both of these options could be designed to completely offset the impacts of development. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat within the area of direct effects.

Townsend's Big-Eared Bat

The Townsend's big-eared bat is a year-round resident in southern California within the Iron Mountain SEZ region. According to the CAReGAP land cover model, approximately 106,522 acres (431 km^2) of potentially suitable foraging habitat on the SEZ could be directly affected by construction and operations (Table 9.2.12.1-1). This direct impact area represents about 2.1% of available suitable foraging habitat in the SEZ region. About 251,169 acres (1,016 km^2) of potentially suitable foraging habitat occurs in the area of potential indirect effects; this area represents about 5.0% of the available suitable foraging habitat in the SEZ region (Table 9.2.12.1-1). The potentially suitable habitat on the SEZ is primarily foraging habitat (desert shrubland); however, suitable roosting habitat may occur on the SEZ. On the basis of an evaluation of land cover types, approximately 10,000 acres (40 km^2) of rocky cliffs and outcrops that may be potentially suitable roosting habitat occurs on the SEZ. An additional 76,000 acres (308 km^2) of rocky cliffs and outcrops occurs in the area of direct effects.

The overall impact on the Townsend's big-eared bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the Iron Mountain SEZ is considered moderate, because the amount of potentially suitable habitat for this species in the area of direct effects represents more than 1% but less than 10% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to reduce indirect impacts to negligible levels.

Avoidance of direct impacts on all foraging habitat (shrublands) is not feasible because suitable foraging habitat (shrublands) is widespread in the area of direct effects and readily available in other portions of the affected area. However, avoiding or minimizing disturbance of all potential roosting habitat (rocky cliffs and outcrops) on the SEZ is feasible and could reduce impacts. If avoidance or minimization of disturbance to all occupied or suitable roosting habitat is not feasible, a compensatory mitigation plan could be developed and implemented to mitigate direct effects. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that uses one or both of these options could be designed to completely offset the impacts of development. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat within the area of direct effects.

Western Mastiff Bat

The western mastiff bat is a year-round resident in southern California within the Iron Mountain region. According to the CAReGAP land cover model, approximately 106,522 acres (431 km^2) of potentially suitable foraging habitat on the SEZ could be directly affected by construction and operations (Table 9.2.12.1-1). This direct impact area represents about 2.3% of available suitable foraging habitat in the SEZ region. About 251,169 acres (1,016 km^2) of potentially suitable foraging habitat occurs in the area of potential indirect effects; this area represents about 5.5% of the available suitable foraging habitat in the SEZ region (Table 9.2.12.1-1). The potentially suitable habitat on the SEZ is primarily foraging habitat (desert shrubland); however, suitable roosting habitat may occur on the SEZ. On the basis of an evaluation of land cover types, approximately 10,000 acres (40 km^2) of rocky cliffs and outcrops that may be potentially suitable roosting habitat occurs on the SEZ. An additional 76,000 acres (308 km^2) of rocky cliffs and outcrops occurs in the area of direct effects.

The overall impact on the western mastiff bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the Iron Mountain SEZ is considered moderate, because the amount of potentially suitable habitat for this species in the area of direct effects represents more than 1% but less than 10% of potentially suitable habitat in the SEZ region. . The implementation of programmatic design features is expected to reduce indirect impacts to negligible levels.

Avoidance of direct impacts on all foraging habitat (shrublands) is not feasible because suitable foraging habitat (shrublands) is widespread in the area of direct effects and readily available in other portions of the affected area. However, avoiding or minimizing disturbance of all potential roosting habitat (rocky cliffs and outcrops) on the SEZ is feasible and could reduce impacts. If avoidance or minimization of disturbance to all occupied or suitable roosting habitat is not feasible, a compensatory mitigation plan could be developed and implemented to mitigate direct effects. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that uses one or both of these options could be designed to completely offset the impacts of development. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat within the area of direct effects.

9.2.12.2.3 Impacts on State-Listed Species

The desert tortoise is the only species listed by the State of California that may occur in the Iron Mountain SEZ affected area (Table 9.2.12.1-1). This species is listed as threatened under the CESA; it is also listed as threatened under the ESA. Impacts on this species are discussed in Section 9.2.12.2.1.

9.2.12.2.4 Impacts on Rare Species

There are 42 species with a state status of S1 or S2 in California or species of concern by the State of California or USFWS that may occur in the affected area of the Iron Mountain SEZ. Impacts have been previously discussed for 15 of these species that are also ESA-listed (Section 9.2.12.2.1), BLM-designated sensitive (Section 9.2.12.2.2), or state-listed (Section 9.2.12.2.3). Impacts on the remaining 27 rare species that do not have any other special status designation are presented in Table 9.2.12.1-1.

9.2.12.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A, Section A.2.2, would greatly reduce or eliminate the potential for effects of utility-scale solar energy development on special status species. While some SEZ-specific design features are best established when project details are being considered, some design features can be identified at this time, including the following:

- Pre-disturbance surveys should be conducted within the SEZ to determine the presence and abundance of all special status species, including those identified in Table 9.2.12.1-1; disturbance to occupied habitats for these species should be avoided or minimized to the extent practicable. If avoiding or minimizing impacts on occupied habitats is not possible, translocation of individuals from areas of direct effect or compensatory mitigation of direct effects on occupied habitats could reduce impacts. A comprehensive mitigation strategy for special status species that uses one or more of these options to offset the impacts of development should be developed in coordination with the appropriate federal and state agencies.

- All desert riparian, wash, and playa habitats within the SEZ should be avoided to the extent practicable. In particular, development should be avoided within Danby Lake, which covers approximately 25,000 acres (100 km^2), and within Homer Wash. Adverse impacts on the following special status species could be reduced with the avoidance of desert riparian, wash, and playa habitats: dwarf germander, Emory’s crucifixion jackass-clover, and Mojave fringe-toed lizard.

- Avoidance or minimization of disturbance to desert dunes and sand transport systems on the SEZ could reduce impacts on several special status species, including the chaparral sand-verbena, dwarf germander, Harwood’s eriastrum, Harwood’s milkvetch, jackass-clover, small-flowered androstephium, Bradley’s cuckoo wasp, Riverside cuckoo wasp, and Mojave fringe-toed lizard.

- Avoidance or minimization of disturbance to rocky cliff and outcrop habitats on the SEZ could reduce impacts on several special status species, including the spiny cliff-brake, California leaf-nosed bat (roosting), Nelson's bighorn sheep, pallid bat (roosting), Townsend's big-eared bat (roosting), and western mastiff bat (roosting).

- Consultations with the USFWS and the CDFG should be conducted to address the potential for impacts on the desert tortoise a species listed as threatened under the ESA and CESA. Consultation would identify an appropriate survey protocol, avoidance measures, and, if appropriate, reasonable and prudent alternatives, reasonable and prudent measures, and terms and conditions for incidental take statements.

- Harassment or disturbance of special status species and their habitats in the affected area should be mitigated. This can be accomplished by identifying any additional sensitive areas and implementing necessary protection measures based upon consultation with the USFWS and CDFG.

If these SEZ-specific design features are implemented in addition to required programmatic design features, impacts on special status species would be reduced.

9.2.13 Air Quality and Climate

9.2.13.1 Affected Environment

9.2.13.1.1 Climate

The proposed Iron Mountain SEZ is located mostly in the southeastern portion of San Bernardino County with a small, southern portion in Riverside County, in southeastern California. The SEZ has an average elevation of about 850 ft (259 m) and lies in the southernmost portion of the Mojave Desert, which has a low desert climate. As a result, the area surrounding the SEZ experiences an extremely arid climate, which is marked by mild winters and hot summers, large daily temperature swings, scant precipitation, high evaporation rates, low relative humidity, and abundant sunshine. Meteorological data collected at the Blythe Airport and Iron Mountain station, which are about 33 mi (53 km) south–southeast of and about 0.6 mi (1 km) west of the Iron Mountain SEZ, respectively, are summarized below.

A wind rose from the Blythe Airport in Blythe, California, for the 5-year period 2005 to 2009 and taken at a level of 33 ft (10 m) is presented in Figure 9.2.13.1-1. During this period, the annual average wind speed at the airport was about 7.6 mph (3.4 m/s), with a prevailing wind direction from the south (about 12.6% of the time) and secondarily from the north–northwest (about 9.0% of the time), parallel to nearby mountain ranges. Wind directions alternated between north–northwest (March, May, August, and October) and south (the rest of the months) throughout the year. In California, general wind flow is from the west or northwest throughout the year, but prevailing wind direction for a given site is influenced by local terrain (NCDC 2010b). Wind speeds categorized as calm (less than 1.1 mph [0.5 m/s]) occurred frequently (almost one-fifth of the time) because of the stable conditions caused by strong radiative cooling from late night to sunrise. Average wind speeds were relatively uniform with the highest in summer and fall at 7.8 mph (3.5 m/s); lower in winter at 7.4 mph (3.3 m/s); and lowest in spring at 7.2 mph (3.2 m/s).

For the 1935 to 2009 period, the annual average temperature at Iron Mountain was 73.7°F (23.2°C) (WRCC 2010b). January was the coldest month with an average minimum temperature of 42.8°F (6.0°C), and July was the warmest month with an average maximum of 108.3°F (42.4°C). On most days in summer, daytime maximum temperatures were in the 100s, and minimums were in the mid-70s or higher. The minimum temperatures recorded were below freezing (≤32°F [0°C]) on fewer than two days of each of the colder months (November through February), but subzero temperatures were never recorded. During the same period, the highest temperature, 122°F (50.0°C), was reached in July 1998, and the lowest, 21°F (–6.1°C), was reached in January 1937. In a typical year, about 168 days had a maximum temperature of ≥90°F (32.2°C), while about 3 days had a minimum temperature at or below freezing.

Pacific air masses lose most of their moisture on the windward side of mountain ranges parallel to the California coastline. Thus, leeward areas like the Iron Mountain SEZ experience a lack of precipitation. For the 1935 to 2009 period, annual precipitation at Iron Mountain

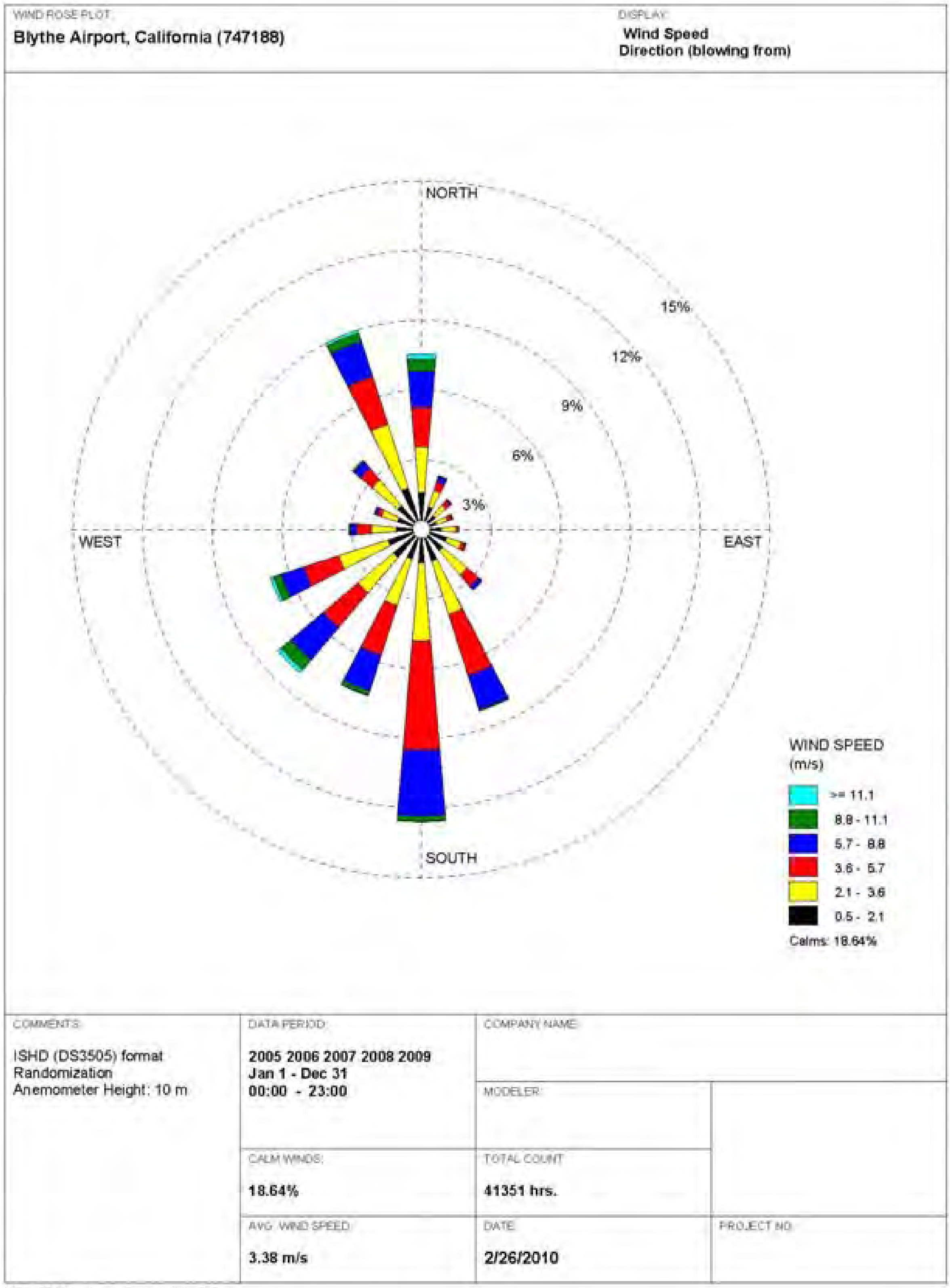

FIGURE 9.2.13.1-1 Wind Rose at 33-ft (10-m) Height at Blythe Airport, Blythe, California, 2005–2009 (Source: NCDC 2010a)

averaged about 3.41 in. (8.7 cm) (WRCC 2010b). There are an average of 19 days annually with measurable precipitation (0.01 in. [0.025 cm] or higher). About 42% of the annual precipitation occurs during winter months, and the remaining precipitation is relatively evenly distributed over the other seasons. Snowfall at Iron Mountain is uncommon and limited to January. The annual average snowfall is about 0.1 in. (0.3 cm), and the highest monthly snowfall recorded was 2.5 in. (6.4 cm) in January 1937.

Because the area surrounding the proposed Iron Mountain SEZ is far from major water bodies (more than 150 mi [240 km]) and because surrounding mountain ranges block air masses from penetrating into the area, severe weather events, such as hurricanes and tornadoes, are rare.

Each year some flash flooding is reported as a result of thunderstorms with heavy rains, especially in areas with steep slopes. Since 1993, 281 floods (mostly flash floods) with peaks in July and August were reported in San Bernardino County (NCDC 2010c), which did cause 12 deaths, 48 injuries, and considerable property and crop damage in total.

In San Bernardino County, 51 hailstorms in total have been reported since 1966, which caused minor property damage. Hail measuring 2.0 in. (5.1 cm) in diameter was reported in 1999. In San Bernardino County, 129 high-wind events, which peaked in winter months, have been reported since 1996; these caused 8 deaths, 70 injuries, and significant property and crop damage (NCDC 2010c). A high-wind event with a maximum wind speed of 120 mph (53.5 m/s) occurred in 1999. Since 1957, 101 thunderstorms, which peaked in summer months, have been reported; these caused 1 death, 5 injuries, and minor property damage. Many thunderstorms in California are accompanied by little to no precipitation, and lightning strikes sometimes cause forest fires (NCDC 2010b).

Since 1998, seven dust storms have been reported in San Bernardino County (NCDC 2010c). The ground surface of the SEZ is covered predominantly with gravelly alluvial sands and fine- to medium-grained eolian sands, which have relatively high duststorm potential. High winds can trigger large amounts of blowing dust in areas of San Bernardino County that have dry and loose soils with sparse vegetation. Dust storms can deteriorate air quality and visibility and have adverse effects on health, particularly for people with asthma or other respiratory problems.

Hurricanes and tropical storms formed off the coast of Central America and Mexico weaken over the cold waters off the California coast. Accordingly, hurricanes rarely hit California. Historically, three tropical storms/depressions have passed within 100 mi (160 km) of the proposed Iron Mountain SEZ (CSC 2010). Tornadoes in San Bernardino County, which encompasses the proposed Iron Mountain SEZ, occur infrequently. In the period 1950 to June 2010, a total of 29 tornadoes (0.5 per year) were reported in San Bernardino County (NCDC 2010c). However, most tornadoes occurring in San Bernardino County were relatively weak (i.e., seven were uncategorized, twenty were F0 or F1, and two were F2 on the Fujita tornado scale). Several of these tornadoes caused three injuries and minor property damage in total. Most tornadoes in San Bernardino County were reported far from the proposed Iron Mountain SEZ.

9.2.13.1.2 Existing Air Emissions

San Bernardino County, which encompasses most of the proposed Iron Mountain SEZ, has many industrial emission sources, which are mainly concentrated over the Valley Region near the City of San Bernardino. No point source emissions are located around the proposed SEZ, except for the Iron Mountain Pumping Station (IMPS). Its annual emissions are relatively minor. Mobile source emissions are substantial because the county is crossed by several interstate highways, including I-10, I-15, I-40, and I-215. Data on annual emissions of criteria pollutants and VOCs in San Bernardino County are presented in Table 9.2.13.1-1 for 2002 (WRAP 2009). Emission data are classified into six source categories: point, area, onroad mobile, nonroad mobile, biogenic, and fire (wildfires, prescribed fires, agricultural fires, structural fires). In 2002, nonroad sources were major contributors to total SO_2 emissions (about 43%) and secondary contributors to total NO_x emissions (about 28%). Point sources were secondary contributors to SO_2 emissions (about 38%), but with contributions comparable to nonroad sources. Onroad sources were major contributors to NO_x and CO emissions (about 31% and 43%, respectively). Biogenic sources (i.e., vegetation— including trees, plants, and crops— and soils) that release naturally occurring emissions accounted for most of VOC emissions (about 91%) and secondarily contributed to CO emissions (about 19%). Area sources accounted for about 70% of PM_{10} and 47% of $PM_{2.5}$. Fire sources are secondary contributors to $PM_{2.5}$ emissions (about 27%).

TABLE 9.2.13.1-1 Annual Emissions of Criteria Pollutants and VOCs in San Bernardino County, California, Encompassing the Proposed Iron Mountain SEZ, 2002[a]

Pollutant[b]	Emissions (tons/yr)
SO_2	3,774
NO_x	102,722
CO	373,128
VOCs	512,377
PM_{10}	44,722
$PM_{2.5}$	17,879

[a] Includes point, area, onroad and nonroad mobile, biogenic, and fire emissions.

[b] Notation: CO = carbon monoxide; NO_x = nitrogen oxides; $PM_{2.5}$ = particulate matter with a diameter of ≤2.5 μm; PM_{10} = particulate matter with a diameter of ≤10 μm; SO_2 = sulfur dioxide; and VOCs = volatile organic compounds.

Source: WRAP (2009).

In 2006, California produced about 483.9 MMt of *gross*[5] carbon dioxide equivalent (CO_2e)[6] emissions (CARB 2010a). GHG emissions in California increased by about 12% from 1990 to 2006, which was three-fourths of the increase in the national rate (about 16%). In 2006, transportation (38.4%) and electricity use (21.9%) were the primary contributors to gross GHG emission sources in California. Fossil fuel use in the residential, commercial, and industrial (RCI) sectors combined accounted for about 29.0% of total state emissions. California's *net* emissions were about 479.8 MMt CO_2e, considering carbon sinks from forestry activities and agricultural soils throughout the state. The U.S. EPA (2009a) also estimated 2005 emissions in California. Its estimate of CO_2 emissions from

[5] Excluding GHG emissions removed as a result of forestry and other land uses and excluding GHG emissions associated with exported electricity.

[6] A measure used to compare the emissions from various GHGs on the basis of their global warming potential, defined as the cumulative radiative forcing effects of a gas over a specified time horizon resulting from the emission of a unit mass of gas relative to a reference gas, CO_2. The CO_2e for a gas is derived by multiplying the mass of the gas by the associated global warming potential.

fossil fuel combustion was 390.6 MMt, which was comparable to the state's estimate. The transportation and RCI sectors accounted for about 58.7% and 30.5% of the CO_2 emissions total, respectively, while electric power generation accounted for the remainder (about 10.8%).

9.2.13.1.3 Air Quality

CAAQS address the same six criteria pollutants as the NAAQS (CARB 2010b; EPA 2010a): SO_2, NO_2, CO, O_3, PM; PM_{10}, $PM_{2.5}$, and Pb. CAAQS are more stringent than the NAAQS for most of criteria pollutants. In addition, California has set standards for some pollutants that are not addressed by the NAAQS: visibility-reducing particles, sulfates, hydrogen sulfide, and vinyl chloride. The NAAQS and CAAQS for criteria pollutants are presented in Table 9.2.13.1-2.

Most of San Bernardino County is located administratively within the Southeast Desert Intrastate Air Quality Control Region (AQCR) (Title 40, Part 81, Section 167 of the *Code of Federal Regulations* [40 CFR 81.167]), along with parts of Kern, Los Angeles, and Riverside Counties, and all of Imperial County. In addition, the Iron Mountain SEZ is located within the Mojave Desert Air Basin, one of 15 geographic air basins designated for the purpose of managing air resources in California, which also includes the desert portions of Kern, Los Angeles, Riverside, and San Bernardino Counties. Currently, the area surrounding the proposed SEZ is designated as being in attainment of NAAQS for all criteria pollutants, except PM_{10} (40 CFR 81.305). However, based on 2006 to 2008 O_3 data, the California Air Resources Board (CARB) recommended designating the area including the Iron Mountain SEZ as a nonattainment area (CARB 2009) under the NAAQS. Further, the area is designated as a nonattainment area for O_3 and PM_{10} based on the CAAQS (CARB 2010c).

With a low population density the Mojave Desert area has no significant emission sources of its own, except mobile emissions along interstate highways. Air quality in the Mojave Desert area primarily depends on upwind emissions transported from the South Coast Air Basin including Los Angeles. As a result of upwind emissions controls, air quality of the Mojave Desert area has improved, but concentrations of ozone are still relatively high.

There are no ambient air-monitoring stations in San Bernardino County near the proposed Iron Mountain SEZ. To characterize ambient air quality around the SEZ, two monitoring stations in San Bernardino County were chosen: Barstow, about 110 mi (177 km) west–northwest, and Victorville, about 120 mi (193 km) west of the SEZ. These monitoring stations are considered as representative of the proposed SEZ. Ambient concentrations of NO_2, CO, O_3, and PM_{10} are recorded at Barstow, while those of SO_2, NO_2, CO, O_3, PM_{10} and $PM_{2.5}$ are recorded at Victorville. No Pb measurements are made in the Mojave Desert area, so Pb measurements from the City of San Bernardino are presented to demonstrate that Pb is not a concern in San Bernardino County. The background concentrations of criteria pollutants at these stations for the 2004 to 2008 period are presented in Table 9.2.13.1-2 (EPA 2010b). Monitored SO_2, NO_2, CO, and Pb levels at either station were lower than their respective standards. Monitored $PM_{2.5}$ levels were approaching the NAAQS and CAAQS, while PM_{10} levels were lower than the NAAQS but higher than the CAAQS. Monitored O_3 concentrations exceeded both the NAAQS and CAAQS.

TABLE 9.2.13.1-2 NAAQS, CAAQS, and Background Concentration Levels Representative of the Proposed Iron Mountain SEZ in San Bernardino County, California, 2004–2008

				Background Concentration Level	
Pollutant[a]	Averaging Time	NAAQS	CAAQS	Concentration[b,c]	Measurement Location, Year
SO_2	1-hour	0.075 ppm[d]	0.25 ppm	0.015 ppm (NA; 6.0%)	Victorville, 2006
	3-hour	0.5 ppm	NA[e]	0.009 ppm (1.8%; NA)	Victorville, 2006
	24-hour	0.14 ppm	0.04 ppm	0.005ppm (3.6%; 13%)	Victorville, 2007
	Annual	0.030 ppm	NA	0.002 ppm (6.7%; NA)	Victorville, 2006
NO_2	1-hour	0.100 ppm[f]	0.18 ppm	0.097 ppm (NA; 54%)	Barstow, 2004
	Annual	0.053 ppm	0.030 ppm	0.023 ppm (43%; 77%)	Barstow, 2004
CO	1-hour	35 ppm	20 ppm	2.6 ppm (7.4%; 13%)	Barstow, 2006
	8-hour	9 ppm	9.0 ppm	1.2 ppm (13%; 13%)	Barstow, 2005
O_3	1-hour	0.12 ppm[g]	0.09 ppm	0.108 ppm (NA; 120%)	Barstow, 2006
	8-hour	0.075 ppm	0.070 ppm	0.090 ppm (120%; 129%)	Barstow, 2008
PM_{10}	24-hour	150 $\mu g/m^3$	50 $\mu g/m^3$	103 $\mu g/m^3$ (69%; 206%)	Barstow, 2007
	Annual	NA[h]	20 $\mu g/m^3$	30 $\mu g/m^3$ (NA; 150%)	Barstow, 2007
$PM_{2.5}$	24-hour	35 $\mu g/m^3$	NA	33 $\mu g/m^3$ (94%; NA)	Victorville, 2004
	Annual	15.0 $\mu g/m^3$	12 $\mu g/m^3$	10.8 $\mu g/m^3$ (72%; 90%)	Victorville, 2004
Pb	30-day	NA	1.5 $\mu g/m^3$	NA	NA
	Calendar quarter	1.5 $\mu g/m^3$	NA	0.02 $\mu g/m^3$ (1.3%; NA)	San Bernardino, 2007
	Rolling 3-month	0.15 $\mu g/m^3$[i]	NA	NA	NA

[a] Notation: CO = carbon monoxide; NO_2 = nitrogen dioxide; O_3 = ozone; Pb = lead; $PM_{2.5}$ = particulate matter with a diameter of ≤2.5 μm; PM_{10} = particulate matter with a diameter of ≤10 μm; and SO_2 = sulfur dioxide.

[b] Monitored concentrations are the highest for calendar-quarter Pb; second-highest for all averaging times less than or equal to 24-hour averages, except fourth-highest daily maximum for 8-hour O_3 and the 98th percentile for 24-hour $PM_{2.5;}$ and arithmetic mean for annual SO_2, NO_2, PM_{10}, and $PM_{2.5}$.

[c] First and second values in parentheses are background concentration levels as a percentage of NAAQS and CAAQS, respectively. Calculation of 1-hour SO_2, 1-hour NO_2, and rolling 3-month Pb to NAAQS was not made because no measurement data based on new NAAQS are available.

[d] Effective August 23, 2010.

[e] NA = not applicable or not available.

[f] Effective April 12, 2010.

[g] The EPA revoked the 1-hour O_3 standard in all areas, although some areas have continuing obligations under that standard (“anti-backsliding”).

[h] Effective December 18, 2006, the EPA revoked the annual PM_{10} standard of 50 $\mu g/m^3$.

[i] Effective January 12, 2009.

Sources: CARB (2010b); EPA (2010a,b).

The PSD regulations (see 40 CFR 52.21), which are designed to limit the growth of air pollution in clean areas, apply to a major new or modification of an existing major source within an attainment or unclassified area (see Section 4.11.2.3). As a matter of policy, the EPA recommends that the permitting authority notify the Federal Land Managers when a proposed PSD source would locate within 62 mi (100 km) of a sensitive Class I area. There are several Class I areas around the Iron Mountain SEZ, only one of which is situated within 62 mi (100 km). The nearest Class I area is the Joshua Tree NP (40 CFR 81.405), about 10 mi (16 km) west-southwest of the Iron Mountain SEZ. This Class I area is not located downwind of prevailing winds at the Iron Mountain SEZ (Figure 9.2.13.1-1). The next nearest Class I areas beyond 62 mi (100 km) are the San Jacinto and San Gorgonio WAs, which are located about 85 mi (136 km) west–southwest and 87 mi (140 km) west of the Iron Mountain SEZ, respectively.

9.2.13.2 Impacts

Potential impacts on ambient air quality associated with a solar project would be of most concern during the construction phase. Impacts on ambient air quality from fugitive dust emissions resulting from soil disturbances are anticipated, but they would be of short duration. During the operations phase, only a few sources with generally low-level emissions would exist for any of the four types of solar technologies evaluated. A solar facility would either not burn fossil fuels or burn only small amounts during operation. (For facilities using HTFs, fuel could be used to maintain the temperature of the HTFs for more efficient daily start-up.) Conversely, solar facilities would displace air emissions that would otherwise be released from fossil fuel power plants.

Air quality impacts shared by all solar technologies are discussed in detail in Section 5.11.1, and technology-specific impacts are discussed in Section 5.11.2. Impacts specific to the proposed Iron Mountain SEZ are presented in the following sections. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and the application of any additional mitigation. Section 9.2.13.3, below, identifies SEZ-specific design features of particular relevance to the Iron Mountain SEZ.

9.2.13.2.1 Construction

The Iron Mountain SEZ has a relatively flat terrain; thus only a minimum number of site preparation activities, perhaps with no large-scale earthmoving operations, would be required. However, fugitive dust emissions from soil disturbances during the entire construction phase would be a major concern, because of the large areas that would be disturbed in a region that experiences windblown dust problems. Fugitive dusts, which are released near ground level, typically have more localized impacts than similar emissions from an elevated stack, which has additional plume rise induced by buoyancy and momentum effects.

Methods and Assumptions

Air quality modeling for PM_{10} and $PM_{2.5}$ emissions associated with construction activities was performed by using the EPA-recommended AERMOD model (EPA 2009b). Details for emissions estimation, the description of AERMOD, input data processing procedures, and modeling assumption are described in Appendix M, Section M.13. Estimated air concentrations were compared with the applicable NAAQS/CAAQS levels at the site boundaries and nearby communities and with PSD increment levels at nearby Class I areas.[7] For the Iron Mountain SEZ, the modeling was conducted based on the following assumptions and input:

- Uniformly distributed emissions over the 3,000 acres (12.1 km^2) each and 9,000 acres (36.4 km^2) in total, and in the west-central portion of the SEZ, close to the nearest residences within IMPS and Joshua Tree NP,

- Surface hourly meteorological data from the Blythe Airport and upper air sounding data from Desert Rock/Mercury, Nevada for the 2005 to 2009 period,

- A regularly spaced receptor grid over a modeling domain of 62 mi × 62 mi (100 km × 100 km) centered on the proposed SEZ, and

- Additional discrete receptors at the SEZ boundaries and at the nearest Class I area—Joshua Tree NP—about 10 mi (16 km) west–southwest of the SEZ.

Results

The modeling results for both PM_{10} and $PM_{2.5}$ concentration increments and total concentrations (modeled plus background concentrations) that would result from construction-related fugitive emissions are summarized in Table 9.2.13.2-1. Maximum 24-hour PM_{10} concentration increments modeled to occur at the site boundaries would be an estimated 498 $\mu g/m^3$, which far exceeds the relevant standard levels of 150 or 50 $\mu g/m^3$. Total 24-hour PM_{10} concentrations of 601 $\mu g/m^3$ would also exceed the standard levels at the SEZ boundary. However, high PM_{10} concentrations would be limited to the immediate area surrounding the SEZ boundary and would decrease quickly with distance. Predicted maximum 24-hour PM_{10} concentration increments would be about 96 $\mu g/m^3$ at the nearest residences within the IMPS, which is located about 0.5 mi west of the SEZ boundary. Except for these residences, no other residences or population centers are located within considerable distances of the SEZ. Predicted maximum 24-hour PM_{10} concentration increments would be about 10 $\mu g/m^3$ at Vidal and Lake

[7] To provide a quantitative assessment, the modeled air impacts of construction were compared to the NAAQS/CAAQS levels and the PSD Class I increment levels. Although the Clean Air Act exempts construction activities from PSD requirements, a comparison with the Class I increment levels was used to quantify potential impacts. Only monitored data can be used to determine the attainment status. Modeled data are used to assess potential problems and as a consideration in the permitting process.

TABLE 9.2.13.2-1 Maximum Air Quality Impacts from Emissions Associated with Construction Activities for the Proposed Iron Mountain SEZ

			Concentration (µg/m3)				Percentage of NAAQS/CAAQS[e]	
Pollutant[a]	Averaging Time	Rank[b]	Maximum Increment[b]	Background[c]	Total	NAAQS/ CAAQS[d]	Increment	Total
PM_{10}	24-hour	H6H	498	103	601	150/50	332/997	401/1,203
	Annual	NA[f]	86.5	30	116	NA/20	NA/432	NA/582
$PM_{2.5}$	24-hour	H8H	32.9	33	65.9	35/NA	94/NA	188/NA
	Annual	NA	8.6	10.8	19.4	15.0/12	58/72	130/162

[a] $PM_{2.5}$ = particulate matter with a diameter of ≤2.5 µm; PM_{10} = particulate matter with a diameter of ≤10 µm.

[b] Concentrations for attainment demonstration are presented. H6H = highest of the sixth-highest concentrations at each receptor over the 5-year period. H8H = highest of the multiyear average of the eighth-highest concentrations at each receptor over the five-year period. For the annual average, multiyear averages of annual means over the five-year period are presented. Maximum concentrations are predicted to occur at the site boundaries.

[c] See Table 9.2.13.1-2.

[d] First and second values are NAAQS and CAAQS, respectively.

[e] First and second values are concentration levels as a percentage of NAAQS and CAAQS, respectively.

[f] NA = not applicable.

Tamarisk, which are about 20 mi (32 km) east and 29 mi (47 km) southwest of the SEZ, respectively. Annual average modeled increment and total (increment plus background) PM_{10} concentration increments at the SEZ boundary would be about 86.5 µg/m^3 and 116 µg/m^3, respectively, which are much higher than the CAAQS level of 20 µg/m^3. Annual PM_{10} increments would be much lower, about 8 µg/m^3, at the nearest residences, and less than 0.2 µg/m^3 at Vidal and Lake Tamarisk. Total 24-hour $PM_{2.5}$ concentrations would be 66 µg/m^3 at the SEZ boundary, which is much higher than the NAAQS level of 35 µg/m^3; modeled increment and background concentrations make comparable contributions to this total. The total annual average $PM_{2.5}$ concentration at the SEZ boundary would be 19.4 µg/m^3, which is above the NAAQS and CAAQS levels of 15.0 and 12 µg/m^3, respectively. At the nearest residences, predicted maximum 24-hour and annual $PM_{2.5}$ concentration increments would be about 5.4 and 0.8 µg/m^3, respectively.

Predicted 24-hour and annual PM_{10} concentration increments at the nearest Class I Area—Joshua Tree NP—would be about 28.3 and 0.6 µg/m^3, or 354% and 15% of the PSD increments for Class I Areas, respectively.

In conclusion, predicted 24-hour and annual PM_{10} and $PM_{2.5}$ concentration levels could exceed the standard levels at the SEZ boundaries and immediate surrounding areas during the construction of solar facilities. To reduce potential impacts on ambient air quality and in compliance with programmatic design features, aggressive dust control measures would be used. Potential air quality impacts on the nearest residences within the IMPS and other nearby residences would be much lower. Modeling indicates that construction activities could result in concentrations above 24-hour, but below annual, Class I PSD PM_{10} increments at the nearest federal Class I area (Joshua Tree NP). While construction activities are not subject to the PSD program and the comparison provides only a screen to gauge the size of the impact, the assumed scenario—in which three construction projects would occur simultaneously near the western boundary near the IMPS residences—is quite conservative. If locations of construction were spread across the SEZ or the projects occurred at different times, potential impacts would be anticipated to be much lower than the aforementioned values. Accordingly, it is anticipated that impacts of construction activities on ambient air quality would be moderate and temporary.

Construction emissions from the engine exhaust from heavy equipment and vehicles could cause impacts on AQRVs (e.g., visibility and acid deposition) at the nearby federal Class I area, Joshua Tree NP, which is not located downwind of prevailing winds but is in close proximity to the SEZ (about 10 mi [16 km]). SO_x emissions from engine exhaust would be very low, because programmatic design features would require that ultra-low-sulfur fuel with a sulfur content of 15 ppm be used. NO_x emissions from engine exhaust would be primary contributors to potential impacts on AQRVs. Construction-related emissions are temporary in nature and thus would cause some unavoidable but short-term impacts.

It is assumed that the existing 230-kV transmission line within the SEZ might be used to connect new solar facilities to the regional grid and that additional project-specific analysis would be conducted for new transmission construction or line upgrades. However, some construction of transmission lines could occur within the SEZ. Potential impacts on ambient air quality would be a minor component of construction impacts in comparison with solar facility construction and would be temporary in nature.

9.2.13.2.2 Operations

Emission sources associated with the operation of a solar facility would include auxiliary boilers; vehicle (commuter, visitor, support, and delivery) traffic; maintenance (e.g., mirror cleaning and repair and replacement of damaged mirrors); and drift from cooling towers for the parabolic trough or power tower technology if wet cooling were implemented (drift comprises low-level PM emissions).

The type of emission sources caused by and offset by operation of a solar facility are discussed in Appendix M, Section M.13.4.

Estimates of potential air emissions displaced by the solar project development at the Iron Mountain SEZ are presented in Table 9.2.13.2-2. Total power generation capacity ranging from 9,469 to 17,043 MW is estimated for the Iron Mountain SEZ for various solar technologies (see Section 9.2.2). The estimated amount of emissions avoided for the solar technologies evaluated depends only on the megawatts of conventional fossil fuel–generated power displaced, because a composite emission factor per megawatt-hour of power by conventional

TABLE 9.2.13.2-2 Annual Emissions from Combustion-Related Power Generation Displaced by Full Solar Development of the Proposed Iron Mountain SEZ

Area Size (acres)	Capacity (MW)[a]	Power Generation (GWh/yr)[b]	Emissions Displaced (tons/yr; 10^3 tons/yr for CO_2)[c]			
			SO_2	NO_x	Hg	CO_2
106,522	9,469–17,043	16,589–29,860	2,121–3,818 (12,530–22,555)	3,484–6,271 (18,467–33,240)	0.03–0.06 (0.15–0.26)	8,242–14,836 (13,090–23,561)
Percentage of total emissions from electric power systems in California[d]			16–28%	16–28%	16–28%	16–28%
Percentage of total emissions from all source categories in California[e]			3.0–5.4%	0.3–0.5%	NA[f]	1.9–3.5%
Percentage of total emissions from electric power systems in the six-state study area[d]			0.85–1.5% (5.0–9.0%)	0.94–1.7% (5.0–9.0%)	1.1–1.9% (5.0–9.0%)	3.1–5.7% (5.0–9.0%)
Percentage of total emissions from all source categories in the six-state study area[e]			0.45–0.81% (2.7–4.8%)	0.13–0.23% (0.68–1.2%)	NA (NA)	1.0–1.8% (1.6–2.8%)

[a] It is assumed that the SEZ would eventually have development on 80% of the lands and that a range of 5 acres (0.020 km^2) per MW (for parabolic trough technology) to 9 acres (0.036 km^2) per MW (power tower, dish engine, and photovoltaic technologies) would be required.

[b] Assumed a capacity factor of 20%.

[c] Composite combustion-related emission factors for SO_2, NO_x, Hg, and CO_2 of 0.26, 0.42, 3.7×10^{-6}, and 994 lb/MWh, respectively, were used for the state of California. Values in parentheses are estimated based on composite combustion-related emission factors for SO_2, NO_x, Hg, and CO_2 of 1.51, 2.23, 1.8×10^{-5}, and 1,578 lb/MWh, respectively, averaged over six southwestern states.

[d] Emission data for all air pollutants are for 2005.

[e] Emission data for SO_2 and NO_x are for 2002, while those for CO_2 are for 2005.

[f] NA = not estimated.

Sources: EPA (2009a,c); WRAP (2009).

technologies is assumed (EPA 2009c). If the Iron Mountain SEZ were fully developed, it is expected that emissions avoided would be substantial. Development of solar power in the SEZ would result in avoided air emissions ranging from 16% to 28% of total emissions of SO_2, NO_x, Hg, and CO_2 from electric power systems in the state of California (EPA 2009c). Avoided emissions would be up to 5.7% of total emissions from electric power systems in the six-state study area. When compared with all source categories, power production from the same solar facilities would displace up to 5.4% of SO_2, 0.5% of NO_x, and 3.5% of CO_2 emissions in the state of California (EPA 2009a; WRAP 2009). These emissions would be up to 1.8% of total emissions from all source categories in the six-state study area. Power generation from fossil fuel–fired power plants accounts for only 53% of the total electric power generation in California, most of which is from natural gas combustion. Thus, solar facilities to be built in the

Iron Mountain SEZ could considerably reduce fuel combustion-related emissions in California but relatively less so than those built in other states with higher fossil use rates.

About one-quarter of electricity consumed in California is generated out of state, with about three-quarters of this amount coming from the southwestern states. Thus it is possible that a solar facility in California would replace power from fossil fuel–fired power plants outside of California but within the six-state study area. It is also possible that electric power transfer between the states will increase in the future. To assess the potential region-wide emissions benefit, emissions being displaced were also estimated based on composite emission factors averaged over the six-state study area. For SO_2, NO_x, and Hg, composite emission factors for the six-state study area would be about 5 to 6 times higher than those for California alone. For CO_2, the six-state emission factor is about 60% higher than the California-only emission factor. If the Iron Mountain SEZ were fully developed, emissions avoided would be considerable. Development of solar power in the SEZ would result in avoided air emissions ranging from 5.0 to 9.0% of total emissions of SO_2, NO_x, Hg, and CO_2 from electric power systems in the six southwestern states. These emissions would be up to 4.8% of total emissions from all source categories in the six-state study area.

As discussed in Section 5.11.1.5, the operation of associated transmission lines would generate some air pollutants from activities such as periodic inspections and maintenance. However, these activities would occur infrequently, and the amount of emissions would be small. In addition, transmission lines could produce minute amounts of O_3 and its precursor NO_x associated with corona discharge (i.e., the breakdown of air near high-voltage conductors), which is most noticeable for higher-voltage lines during rain or very humid conditions. Since the Iron Mountain SEZ is located in an arid desert environment, these emissions would be small, and potential impacts on ambient air quality would be negligible, considering the infrequent occurrence and small amount of emissions from corona discharges.

9.2.13.2.3 Decommissioning/Reclamation

As discussed in Section 5.11.1.4, decommissioning/reclamation activities are similar to construction activities but on a more limited scale and of shorter duration. Potential impacts on ambient air quality would be correspondingly less than those from construction activities. Decommissioning activities would last for a short period, and their potential impacts would be moderate and temporary. The same design features adopted during the construction phase would also be implemented during the decommissioning phase (Section 5.11.3).

9.2.13.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features are required. Limiting dust generation during construction and operations at the proposed Iron Mountain SEZ (such as increased watering frequency or road paving or treatment) is a required design feature under BLM's Solar Energy Program. These extensive fugitive dust control measures would keep off-site PM levels as low as possible during construction.

9.2.14 Visual Resources

9.2.14.1 Affected Environment

The proposed Iron Mountain SEZ is located within the CDCA in San Bernardino County in southeastern California. The SEZ occupies 106,522 acres (431 km^2) within the central portion of Ward Valley and extends approximately 19 mi (31 km) east to west and 14 mi (23 km) north to south. The SEZ lies within the Sonoran Basin and Range ecoregion (EPA 2007), typified by small, rocky mountain ranges with jagged peaks alternating with talus slopes and desert floor. Flat basins form broad flat expanses of barren plains, generally with low scrub vegetation and expansive views. Dark browns and garnets are the dominant mountain hues, although blues and purples prevail as viewing distance increases. In contrast, lighter brown and tan soils dominate the desert floor, sparsely dotted with the grey-green of Sonoran creosotebush and golden bursage scrub vegetation (BLM and CEC 2010a). The SEZ and surrounding mountain ranges are shown in Figure 9.2.14.1-1.

The SEZ ranges in elevation from 186 ft (57 m), at a low point in Danby Lake, to 510 ft (155 m), at the base of the Turtle Mountains. The Iron Mountain SEZ is located within the USFS's Cadiz-Vidal subsection, which consists of widely separated mountain ranges in desert plains (USFS 1997).

The SEZ is located within the flat treeless plain of the Ward Valley floor, with the strong horizon line and the forms of surrounding mountain ranges being the dominant visual features. A dry soda lake bed (Danby Lake) is a visually prominent feature in the northwest portion of the SEZ. Danby Lake occupies the lowest portion of the SEZ, and the valley floor slopes gently toward Danby Lake in all directions.

The SEZ is closely bounded by mountain ranges to the east and west, with somewhat more distant mountains to the south and southwest, but much more open views to the southeast and north. The Turtle Mountains rise abruptly directly east of the SEZ, and the Iron Mountains are directly west of the SEZ. The Granite Mountains are located approximately 5 mi (8 km) southwest of the SEZ, and the Little Maria Mountains approximately 10 mi (16 km) to the south. These ranges include peaks generally between 2,000 and 3,500 ft (600 and 1,100 m) in elevation, but some peaks are higher than 5,000 ft (1,524 m) in the Old Woman Mountains. To the southeast, the broad Rice Valley extends more than 15 mi (24 km) to the Big Maria Mountains. The Old Woman Mountains extend northward from the northwest corner of the SEZ, but directly north and slightly east of north from the SEZ, the Ward Valley floor extends more than 25 mi (40 km).

Vegetation is generally sparse in much of the SEZ, with widely spaced shrubs in more or less barren gravel flats. Vegetation within the SEZ is predominantly scrubland, with creosotebush, white bursage, and other low shrubs dominating the Ward Valley floor.

During an August 2009 site visit, the vegetation presented a limited range of greens (mostly the olive green of creosotebushes) and tans (from dried grasses and forbes), with

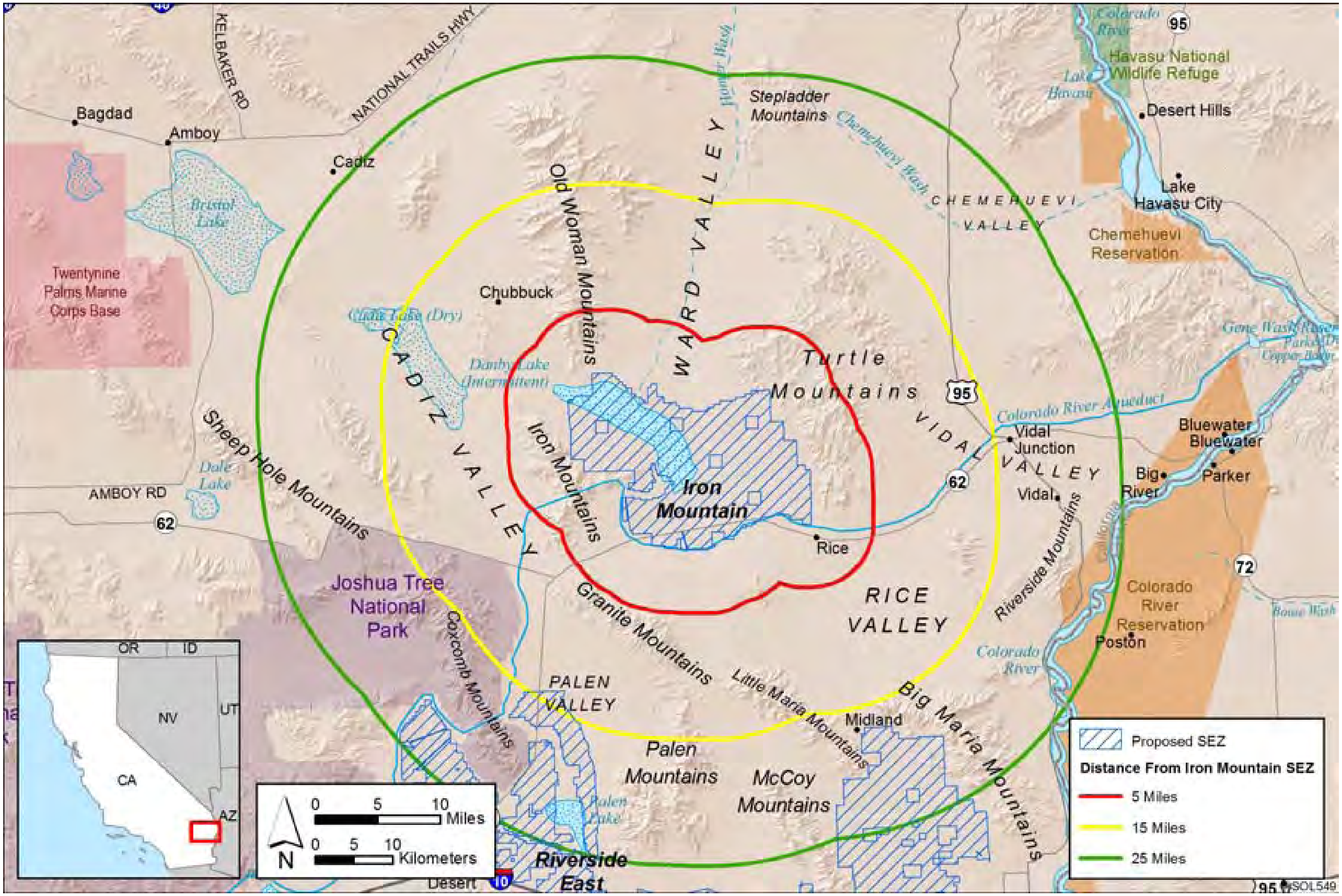

FIGURE 9.2.14.1-1 Proposed Iron Mountain SEZ and Surrounding Lands

medium to coarse textures and generally low visual interest. In the south-central portion of the SEZ, soils are somewhat sandy, finely textured, and very light brown; in other portions of the SEZ the gravel flats present a more coarse texture and light gray color.

There is no permanent surface water within the SEZ; however, Danby Lake in the northwestern portion of the SEZ is subject to periodic flooding. The lake floor is visually conspicuous because of the lack of vegetation and the stark white of the sodium deposits, which contrast in color with the olive green of the creosotebushes and the other colors of the sparse vegetation common to the gravel flats in the surrounding areas.

Cultural disturbances visible within the SEZ include State Route 62, a two-lane highway that passes through the southern edge of the SEZ. While traffic volume on State Route 62 is light, traffic on the highway would be visible from some locations in the southern portion of the SEZ. A railroad traverses the SEZ from the northwest to the southeast, roughly bisecting the SEZ. The railroad in this area is unused or very rarely used, with a few abandoned tank cars present. Cadiz Road is an unpaved road adjacent to and paralleling the railroad. Views to the northeast from Cadiz Road are partially blocked by the railroad embankment. The abandoned town of Milligan is located in the northwest corner of the SEZ. Trailers used by sodium lease operators working the active sodium lease in the northwest portion of the SEZ are visible approximately 1.3 mi (2.2 km) east of Milligan on Cadiz Road. An existing 230-kV transmission line runs north–south through the western portion of the SEZ. These cultural modifications generally detract from the scenic quality of the SEZ; however, the SEZ is so large that from many locations within the SEZ these features are either not visible or so distant as to have minimal effect on views. From most locations within the SEZ, the landscape is generally natural in appearance, with little disturbance visible.

The general lack of topographic relief, water, and variety results in low scenic value within the SEZ itself; however, because of the flatness of the landscape, the lack of trees, and the breadth of the Ward Valley, the SEZ presents a vast panoramic landscape with sweeping views of the surrounding mountains that add significantly to the scenic values within the SEZ viewshed. In general, the mountains appear to be devoid of vegetation, and their generally jagged, irregular form and brown/garnet colors provide dramatic visual contrasts to the strong horizontal line, green vegetation, and light-colored soils of the valley floor, particularly when viewed from nearby locations within the SEZ. Panoramic views of the SEZ are shown in Figures 9.2.14.1-2 and 9.2.14.1-3.

The mountain slopes and peaks around the SEZ are, in general, visually pristine, because they are largely within congressionally designated WAs. The boundary of the Turtle Mountains WA is immediately adjacent to the eastern edge of the SEZ; the Palen-McCoy WA is visible to the south; and Old Woman Mountains WA is adjacent to the northwest corner of the SEZ, and they are separated only by the railroad and an adjacent narrow strip of land. Southeast of the SEZ, the dunes of Rice Valley WA rise 30 to 40 ft (9 to 12 m) above the surface to form a long, narrow band running through the middle of the valley floor. The Iron Mountains immediately west of the SEZ are not within a WA, and a pumping station managed by the MWD and located at the eastern base of the Iron Mountains is visible from nearby portions of the SEZ, as is the

FIGURE 9.2.14.1-2 Approximately 180° Panoramic View of the Proposed Iron Mountain SEZ, Including Granite Mountains at Far Left (Southwest), Iron Mountains at Center (West), Old Woman Mountains at Right (Northwest), and Cadiz Road in Foreground

FIGURE 9.2.14.1-3 Approximately 180° Panoramic View of the Proposed Iron Mountain SEZ, Including Turtle Mountains at Left and Center (North and East), Railroad, Cadiz Road, and Arica Mountains at Right (Southeast)

service road to the pumping station. In this same general area, remnants of the WWII training camps are visible but detract little from scenic values of the SEZ.

Views of the valley floor from the mountains are also important in terms of scenic quality, because much of the region's recreation takes place at higher elevations. Some of these peaks are popular with climbers, and hiking trails provide opportunities for solitude. In addition to the four WAs discussed above, important scenic resources within the 25-mi (40-km) viewshed of the SEZ are Joshua Tree NP, Joshua Tree WA, Big Maria Mountains WA, Riverside Mountains WA, Whipple Mountains WA, Stepladder Mountains WA, Cadiz Dunes WA, Sheephole Valley WA, Turtle Mountains Scenic ACEC, and Turtle Mountains NNL.

The BLM conducted a VRI for the SEZ and surrounding lands in 2010 (BLM 2010d). The VRI evaluates BLM-administered lands based on scenic quality; sensitivity level, in terms of public concern for preservation of scenic values in the evaluated lands; and distance from travel routes or KOPs. Based on these three factors, BLM-administered lands are placed into one of four VRI Classes, which represent the relative value of the visual resources. Class I and II are the most valued; Class III represents a moderate value; and Class IV represents the least value. Class I is reserved for specially designated areas, such as national wildernesses and other congressionally and administratively designated areas, for which decisions have been made to preserve a natural landscape. Class II is the highest rating for lands without special designation. More information about VRI methodology is available in Section 5.12 and in *Visual Resource Inventory*, BLM Manual Handbook 8410-1 (BLM 1986a).

The VRI map for the SEZ and surrounding lands is shown in Figure 9.2.14.1-4. The VRI values for the SEZ and immediate surroundings are VRI Classes IV, III, and II, indicating low, moderate, and high relative visual values, respectively. The majority of the SEZ is rated VRI Class IV or III, with most of the northern portion of the SEZ receiving a Class IV rating, and the southern portion of the SEZ receiving a Class III rating. There are two very small areas of VRI Class II lands in the SEZ. An area of VRI Class II land encompassing about 58 acres (0.23 km^2) is located at the far eastern portion of the SEA in the Iron Mountains, and a larger area (393 acres [1.59 km^2]) is located in the far northeastern portion of the SEZ, at the base of the Turtle Mountains.

The inventory indicates low scenic quality for the SEZ and its immediate surroundings, based in part on the lack of topographic relief and water features and on the relative commonness of the landscape type within the region. Positive scenic quality attributes included some variety in vegetation types and color and attractive off-site views; however, these positive attributes were insufficient to raise the scenic quality to the "Moderate" level. The inventory indicates moderate sensitivity for the northern portion of the SEZ and its immediate surroundings, noting relatively low levels of use and public interest, but high sensitivity for the southern portion of the SEZ within the State Route 62 foreground/middleground viewshed because State Route 62 receives moderate use, and provides access to Joshua Tree National Park, nearby historical military camps, and wilderness areas.

Within the Needles and Palm Springs-South Coast FOs, lands within the 25-mi (40-km), 650-ft (198-m) viewshed of the SEZ contain 114,638 acres (463.924 km^2) of VRI Class I lands,

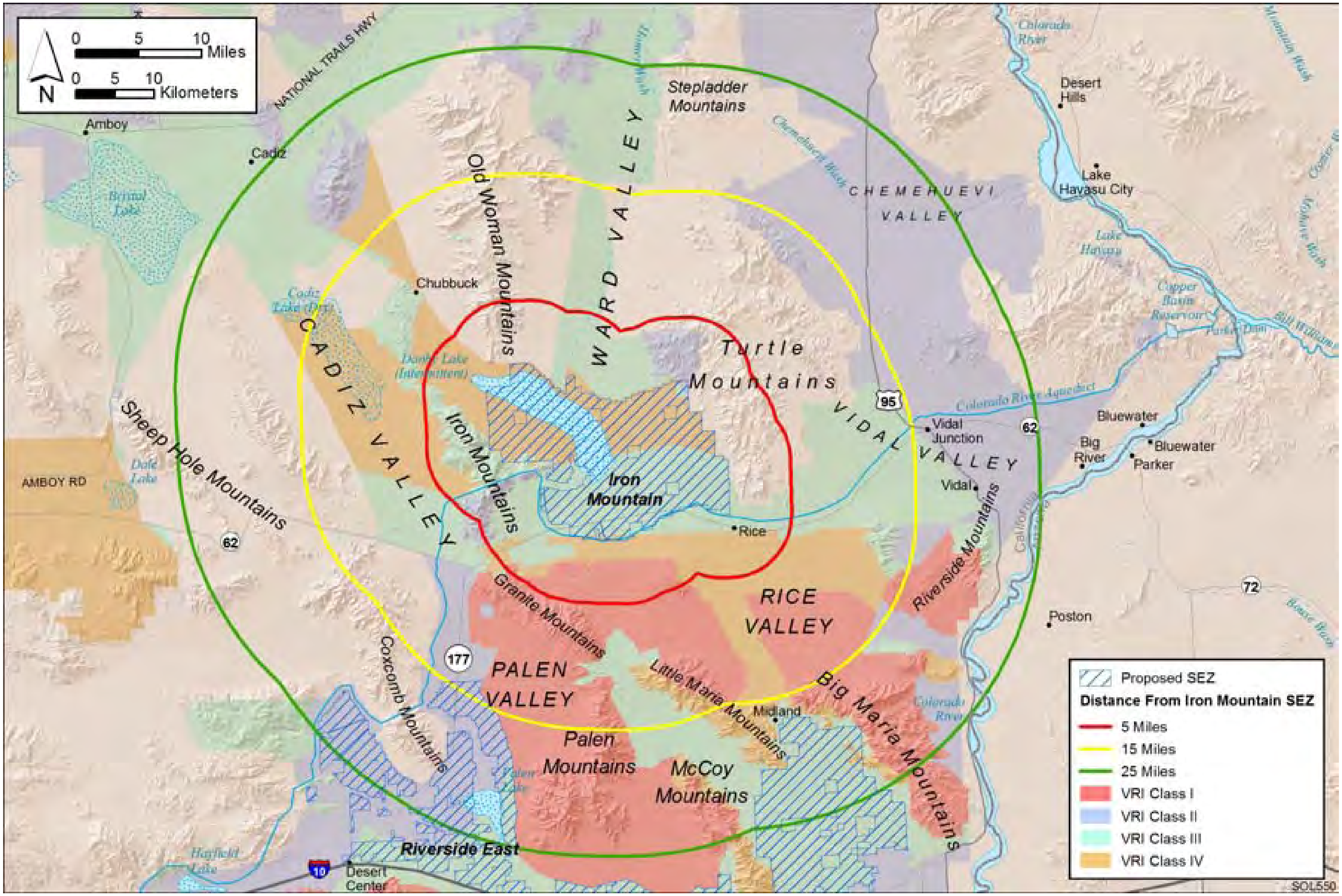

FIGURE 9.2.14.1-4 Visual Resource Inventory Values for the Proposed Iron Mountain SEZ and Surrounding Lands

primarily south of the SEZ in the Granite, Palen, and Big Maria Mountains; 38,979 acres (157.74 km^2) of VRI Class II lands, primarily northeast of the SEZ in the Turtle Mountains and southwest of the SEZ in the Iron Mountains; 244,875 acres (990.974 km^2) of Class III lands, primarily in the Ward, Cadiz, and Vidal Valleys; and 195,350 acres (790.553 km^2) of VRI Class IV lands, primarily in the Ward, Cadiz, and Rice Valleys.

The BLM has not assigned VRM classes to the SEZ and surrounding lands. More information about the BLM VRM program is available in Section 5.12 and in *Visual Resource Management*, BLM Manual Handbook 8400 (BLM 1984).

9.2.14.2 Impacts

The potential for impacts from utility-scale solar energy development on visual resources within the proposed Iron Mountain SEZ and surrounding lands, as well as the impacts of related facilities (e.g., access roads and transmission lines) outside of the SEZ, is presented in this section.

Site-specific impact assessment is needed to systematically and thoroughly assess visual impact levels for a particular project. Without precise information about the location of a project and a relatively complete and accurate description of its major components and their layout, it is not possible to precisely assess the visual impacts associated with the facility. However, if the general nature and location of a facility are known, a more generalized assessment of potential visual impacts can be made by describing the range of expected visual changes and discussing contrasts typically associated with these changes. In addition, a general analysis can identify sensitive resources that may be at risk if a future project is sited in a particular area. Detailed information about the methodology employed for the visual impact assessment used in this PEIS, including assumptions and limitations, is presented in Appendix M.

Potential Glint and Glare Impacts. Similarly, the nature and magnitude of potential glint- and glare-related visual impacts for a given solar facility is highly dependent on viewer position, sun angle, the nature of the reflective surface and its orientation relative to the sun and the viewer, atmospheric conditions, and other variables. The determination of potential impacts from glint and glare from solar facilities within a given proposed SEZ would require precise knowledge of these variables and is not possible given the scope of this PEIS. Therefore, the following analysis does not describe or suggest potential contrast levels arising from glint and glare for facilities that might be developed within the SEZ; however, it should be assumed that glint and glare are possible visual impacts from *any* utility-scale solar facility, regardless of size, landscape setting, or technology type. The occurrence of glint and glare at solar facilities could potentially cause large though temporary increases in brightness and visibility of the facilities. The visual contrast levels projected for sensitive visual resource areas discussed in the following analysis do not account for potential glint and glare effects; however, these effects would be incorporated into a future site- and project-specific assessment that would be conducted for specific proposed utility-scale solar energy projects. For more information about potential glint and glare impacts associated with utility-scale solar energy facilities, see Section 5.12 of this PEIS.

9.2.14.2.1 Impacts on the Proposed Iron Mountain SEZ

Some or all of the SEZ could be developed for one or more utility-scale solar energy projects, utilizing one or more of the solar energy technologies described in Appendix F. Because of the industrial nature and large size of utility-scale solar energy facilities, large visual impacts on the SEZ would occur as a result of the construction, operation, and decommissioning of solar energy projects. In addition, large impacts could occur at solar facilities utilizing highly reflective surfaces or major light-emitting facility components (e.g., solar dish, parabolic trough, and power tower technologies), with lesser impacts associated with reflective surfaces expected from PV facilities. These impacts would be expected to involve major modification of the existing character of the landscape and would likely dominate the nearby views. Additional, and potentially large, impacts would occur as a result of the construction, operation, and decommissioning of related facilities, such as access roads and electric transmission lines. While the primary visual impacts associated with solar energy development within the SEZ would occur during daylight hours, lighting required for utility-scale solar energy facilities would be a potential source of visual impacts at night, both within the SEZ and on surrounding lands.

Common and technology-specific visual impacts from utility-scale solar energy development, as well as impacts associated with electric transmission lines, are discussed in Section 5.12 of this PEIS. Impacts would last throughout construction, operation, and decommissioning, and some impacts could continue after project decommissioning. Visual impacts resulting from solar energy development in the SEZ would be in addition to impacts from solar energy development and other development that may occur on other public or private lands within the SEZ viewshed, and are subject to cumulative effects. For discussion of cumulative impacts, see Section 9.2.22.4.13 of the PEIS.

The changes described above would be expected to be consistent with BLM VRM objectives for VRM Class IV, as seen from nearby KOPs. More information about impact determination using the BLM VRM program is available in Section 5.12 and in *Visual Resource Contrast Rating*, BLM Manual Handbook 8431-1 (BLM 1986b).

Implementation of the programmatic design features intended to reduce visual impacts (described in Appendix A, Section A.2.2, of this PEIS) would be expected to reduce visual impacts associated with utility-scale solar energy development within the SEZ. However, the degree of effectiveness of these design features could be assessed only at the site- and project-specific assessment level. Because of the large scale, reflective surfaces, and strong regular geometry of utility-scale solar energy facilities and the lack of screening vegetation and landforms within the SEZ viewshed, siting the facilities away from sensitive visual resource areas and other sensitive viewing areas would be the primary means of mitigating visual impacts. The effectiveness of other visual impact mitigation measures would generally be limited, but would be important to reduce visual contrasts to the greatest extent possible.

9.2.14.2.2 Impacts on Lands Surrounding the Proposed Iron Mountain SEZ

Because of the large size of utility-scale solar energy facilities and the generally flat, open nature of the proposed SEZ, lands outside the SEZ would be subjected to visual impacts related to the construction, operation, and decommissioning of utility-scale solar energy facilities. The affected areas and extent of impacts would depend on a number of visibility factors and viewer distance (for a detailed discussion of visibility and related factors, see Section 5. 12). A key component in determining impact levels is the intervisibility between the project and potentially affected lands; if topography, vegetation, or structures screen the project from viewer locations, there is no impact.

Preliminary viewshed analyses were conducted to identify which lands surrounding the proposed SEZ could have views of solar facilities in at least some portion of the SEZ (see Appendix N for important information on assumptions and limitations of the methods used). Four viewshed analyses were conducted, assuming four different heights representative of project elements associated with potential solar energy technologies: PV and parabolic trough arrays (24.6 ft [7.5 m]), solar dishes and power blocks for concentrating solar power (CSP) technologies (38 ft [11.6 m]), transmission towers and short solar power towers (150 ft [45.7 m]), and tall solar power towers (650 ft [198.1 m]). Viewshed maps for the SEZ for all four solar technology heights are presented in Appendix N.

Figure 9.2.14.2-1 shows the combined results of the viewshed analyses for all four solar technologies. The colored segments indicate areas with clear lines of sight to one or more areas within the SEZ and from which solar facilities within these areas of the SEZ would be expected to be visible, assuming the absence of screening vegetation or structures and adequate lighting and other atmospheric conditions. The light brown areas are locations from which PV and parabolic trough arrays located in the SEZ could be visible. Solar dishes and power blocks for CSP technologies would be visible from the areas shaded in light brown and the additional areas shaded in light purple. Transmission towers and short solar power towers would be visible from the areas shaded light brown and light purple and the additional areas shaded in dark purple. Power tower facilities located in the SEZ could be visible from areas shaded light brown, light purple, and dark purple, and at least the upper portions of power tower receivers could be visible from the additional areas shaded in medium brown.

For the following visual impact discussion, the tall solar power tower (650 ft [198.1 m]) and PV and parabolic trough array (24.6 ft [7.5 m]) viewsheds are shown in the figures and discussed in the text. These heights represent the maximum and minimum landscape visibility for solar energy technologies analyzed in this PEIS. Viewsheds for solar dish and CSP technology power blocks (38 ft [11.6 m]) and for transmission towers and short solar power towers (150 ft [45.7 m]) are presented in Appendix N. The visibility of these facilities would fall between that for tall power towers and PV and parabolic trough arrays.

Impacts on Selected Federal-, State-, and BLM-Designated Sensitive Visual Resource Areas

Figure 9.2.14.2-2 shows the results of a GIS analysis that overlays selected federal, state, and BLM-designated sensitive visual resource areas onto the combined tall solar power tower (650 ft [198.1 m]) and PV and parabolic trough array (24.6 ft [7.5 m]) viewsheds, in order to illustrate which of these sensitive visual resource areas could have views of solar facilities within

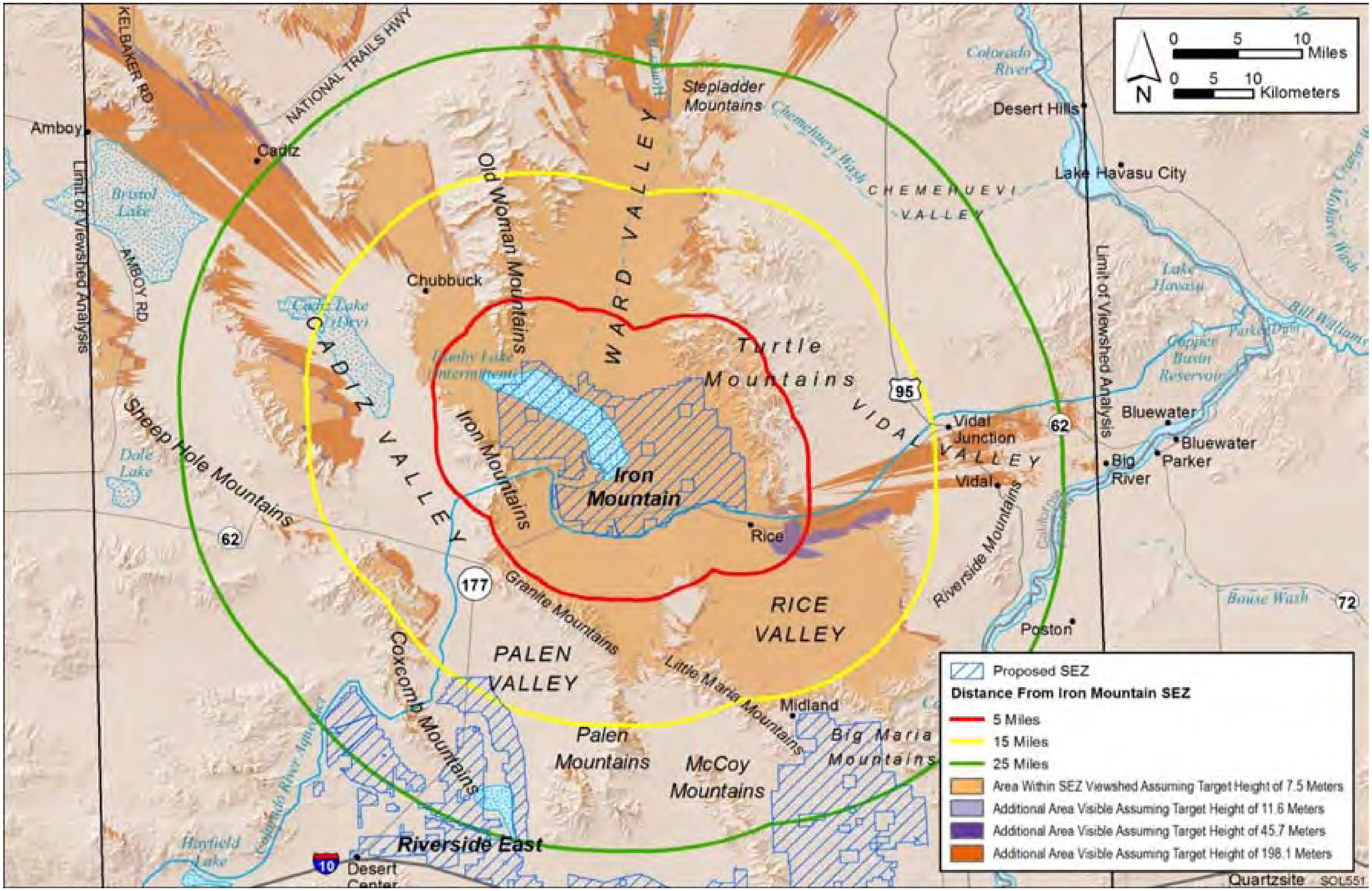

FIGURE 9.2.14.2-1 Viewshed Analyses for the Proposed Iron Mountain SEZ and Surrounding Lands, Assuming Solar Technology Heights of 24.6 ft (7.5 m), 38 ft (11.6 m), 150 ft (45.7 m), and 650 ft (198.1 m) (shaded areas indicate lands from which solar development within the SEZ could be visible)

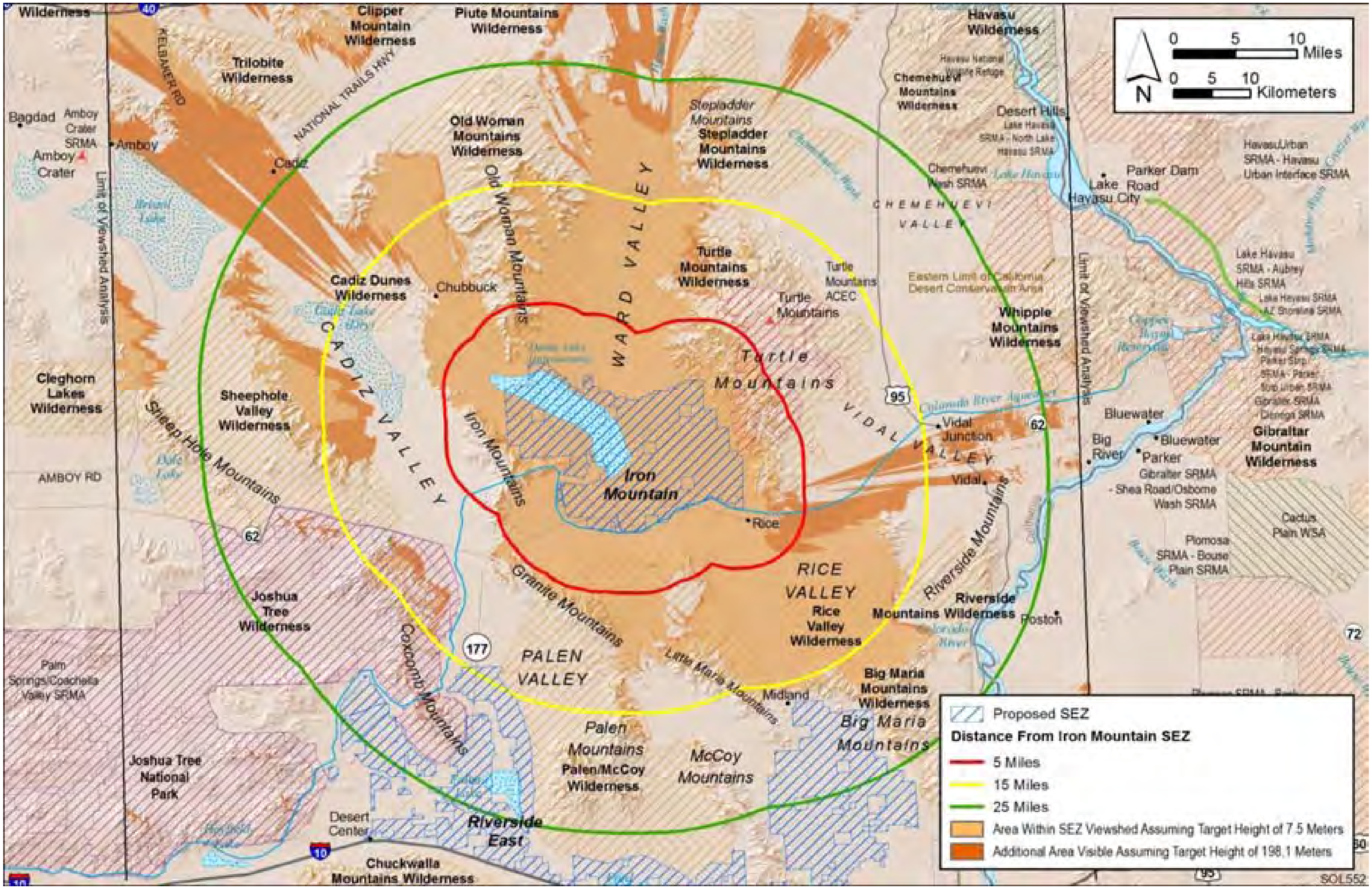

FIGURE 9.2.14.2-2 Overlay of Selected Sensitive Visual Resource Areas onto Combined 650-ft (198.1-m) and 24.6-ft (7.5-m) Viewsheds for the Proposed Iron Mountain SEZ

the SEZ and therefore potentially would be subject to visual impacts from those facilities. Distance zones that correspond with the BLM's VRM system-specified foreground–middleground distance (5 mi [8 km]), background distance (15 mi [24 km]), and a 25-mi (40-km) distance zone are shown as well, in order to indicate the effect of distance from the SEZ on impact levels, which are highly dependent on distance.

The scenic resources included in the analyses were as follows:

- National Parks, National Monuments, National Recreation Areas, National Preserves, National Wildlife Refuges, National Reserves, National Conservation Areas, National Historic Sites;
- Congressionally authorized Wilderness Areas;
- Wilderness Study Areas;
- National Wild and Scenic Rivers;
- Congressionally authorized Wild and Scenic Study Rivers;
- National Scenic Trails and National Historic Trails;
- National Historic Landmarks and National Natural Landmarks;
- All-American Roads, National Scenic Byways, State Scenic Highways; and BLM- and USFS-designated scenic highways/byways;
- BLM-designated Special Recreation Management Areas; and
- ACECs designated because of outstanding scenic qualities.

Potential impacts on specific sensitive resource areas visible from and within 25 mi (40 km) of the proposed Iron Mountain SEZ are discussed below. The results of this analysis are also summarized in Table 9.2.14.2-1. Further discussion of impacts on these areas is presented in Sections 9.2.3 (Specially Designated Areas and Lands with Wilderness Characteristics) and 9.2.17 (Cultural Resources) of this PEIS.

The following visual impact analysis describes *visual contrast levels*, rather than *visual impact levels*. *Visual contrasts* are changes in the seen landscape, including changes in the forms, lines, colors, and textures of objects seen in the landscape. A measure of *visual impact* includes potential human reactions to the visual contrasts arising from a development activity, based on viewer characteristics, including attitudes and values, expectations, and other characteristics that are viewer- and situation-specific. Accurate assessment of visual impacts requires knowledge of the potential types and numbers of viewers for a given development and their characteristics and expectations; specific locations where the project might be viewed from; and other variables that were not available or not feasible to incorporate in this PEIS analysis. These variables would be

GOOGLE EARTH™ VISUALIZATIONS

The visual impact analysis discussion in this section utilizes three-dimensional Google Earth™ perspective visualizations of hypothetical solar facilities placed within the SEZ. The visualizations include simplified wireframe models of a hypothetical solar power tower facility. The models were placed at various locations within the SEZ as visual aids for assessing the approximate size and viewing angle of utility-scale solar facilities. The visualizations are intended to show the apparent size, distance, and configuration of the SEZ, as well as the apparent size of a typical utility-scale solar power tower project and its relationship to the surrounding landscape, as viewed from potentially sensitive visual resource areas within the viewshed of the SEZ.

The visualizations are not intended to be realistic simulations of the actual appearance of the landscape or of proposed utility-scale solar energy projects. The placement of models within the SEZ did not reflect any actual planned or proposed projects within the SEZ and did not take into account engineering or other constraints that would affect the siting or choice of facilities for this particular SEZ. The number of facility models placed in the SEZ does not reflect the 80% development scenario analyzed in this PEIS, but the discussion of expected visual contrast levels does account for the 80% development scenario. A solar power tower was chosen for the models because the unique height characteristics of power tower facilities make their visual impact potential extend beyond other solar technology types.

incorporated into a future site- and project-specific assessment that would be conducted for specific proposed utility-scale solar energy projects. For more discussion of visual contrasts and impacts, see Section 5.12 of the PEIS.

National Parks

- Joshua Tree—Joshua Tree National Park is located approximately 9.9 mi (15.9 km) southwest of the SEZ at the point of closest approach. The vast park is a popular winter climbing area and contains paved roads popular for scenic driving, several miles of hiking trails, and four-wheel drive roads. There are campgrounds, and backcountry camping and hiking are allowed. Stargazing is popular year round, as is bird watching. Most of the park's services and facilities are in the western portion of the park, as is most recreational use; however, the undeveloped wilderness portions of the park, including those areas near the SEZ, are visited by persons seeking solitude, or wilderness experiences or engaging in other activities appropriate to the relatively undisturbed environment.

  As shown in Figure 9.2.14.2-2, solar energy facilities within the SEZ could be visible from the far northeastern and eastern portions of the park (approximately 14,606 acres [59.108 km^2] in the 650-ft [198.1-m] viewshed, or 1.8% of the total park acreage, and 7,551 acres [30.56 km^2] in the 24.6-ft [7.5 m] viewshed, or 1.0% of the total park acreage). The area of the national park with potential visibility of solar facilities in the SEZ extends approximately 21 mi (33 km) from the southwestern boundary of the SEZ. This area includes the northeast-facing slopes of the Coxcomb Mountains,

TABLE 9.2.14.2-1 Selected Potentially Affected Sensitive Visual Resources within 25-mi Viewshed of the Proposed Iron Mountain SEZ, Assuming a Target Height of 650 ft (198.1 m)

		Feature Area or Linear Distance[a]		
			Visible between	
Feature Type	Feature Name (Total Acreage)	Visible within 5 mi	5 mi and 15 mi	15 mi and 25 mi
National Park	Joshua Tree (793,331 acres)	0 acres	8,931 acres (1.1%)[b]	5,675 acres (0.7%)
National Conservation Area	California Desert (25,919,319 acres)	308,931 acres (1.2%)	318,258 acres (1.2%)	194,332 acres (0.7%)
WAs	Big Maria Mountains (46,056 acres)	0 acres	0 acres	8,974 acres (19.5%)
	Cadiz Dunes (21,286 acres)	0 acres	79 acres (0.4%)	1,394 acres (6.6%)
	Joshua Tree (586,623 acres)	0 acres	8,898 acres (1.5%)	5,435 acres (0.9%)
	Old Woman Mountains (183,555 acres)	20,092 acres (10.9%)	53,934 acres (29.4%)	14,734 acres (8.0%)
	Palen-McCoy (224,414 acres)	19,297 acres (8.6%)	38,016 acres (16.9%)	14,734 acres (6.6%)
	Rice Valley (43,412 acres)	0 acres	34,944 acres (80.5%)	5,695 acres (13.1%)
	Riverside Mountains (24,206 acres)	0 acres	688 acres (2.8%)	130 acres (0.5%)
	Sheephole Valley (195,002 acres)	0 acres	11,755 acres (6.0%)	25,278 acres (13.0%)
	Stepladder Mountains (84,187 acres)	0 acres	0 acres	12,833 acres (15.2%)
	Turtle Mountains (182,610 acres)	26,358 acres (14.4%)	43,947 acres (24.1%)	2,787 acres (1.5%)
	Whipple Mountains (78,484 acres)	0 acres	0 acres	97 acres (0.1%)

TABLE 9.2.14.2-1 (Cont.)

		Feature Area or Linear Distance[a]		
			Visible between	
Feature Type	Feature Name (Total Acreage)	Visible within 5 mi	5 mi and 15 mi	15 mi and 25 mi
National Natural Landmark	Turtle Mountains (50,057 acres)	9,384 acres (18.7%)	640 acres (1.3%)	0 acres
ACEC designated for outstanding scenic values	Turtle Mountains (50,057 acres)	9,384 acres (18.7%)	640 acres (1.3%)	0 acres

[a] To convert acres to km^2, multiply by 0.004047, to convert mi to km, multiply by 1.609.

[b] Percentage of total feature area for areal features.

down to approximately 1,150 ft (350 m) in elevation at the lowest points. Visitation to this part of the park is low.

Figure 9.2.14.2-3 is Google Earth visualization of the SEZ as seen from an unnamed peak in the northeastern portion of the national park, approximately 14 mi (23 km) from the southeast portion of the SEZ. The viewpoint is 3,000 ft (900 m) higher in elevation than the SEZ. The visualization includes simplified wireframe models of a hypothetical solar power tower facility. The models were placed within the SEZ as a visual aid for assessing the approximate size and viewing angle of utility-scale solar facilities. The receiver towers depicted in the visualization are properly scaled models of a 459-ft (139.9-m) power tower with an 867-acre (3.5-km^2) field of 12-ft (3.7-m) heliostats, each representing approximately 100 MW of electric generating capacity. Five groups of four models were placed in the SEZ for this and other visualizations shown in this section of this PEIS. In the visualization, the SEZ area is depicted in orange, the heliostat fields in blue.

The upper slopes and peaks of the Coxcomb Mountains are barren, with little opportunity for screening. As shown in the visualization, a substantial portion of the SEZ would be visible from this location through a gap between the Iron Mountains to the west and the Granite Mountains to the east. At the higher elevations within the national park, the angle of view would be great enough that the tops of solar collector/reflector arrays might be visible in some locations. At lower elevations the angle of view would be lower, so that solar collector/reflector arrays would repeat the line of the plain in which the SEZ is located, tending to reduce contrast. If power towers were present within the SEZ, when operating, the receivers would likely appear as distant points of light against the backdrop of the valley floor, or possibly the Turtle Mountains, depending on viewing angle and facility location.

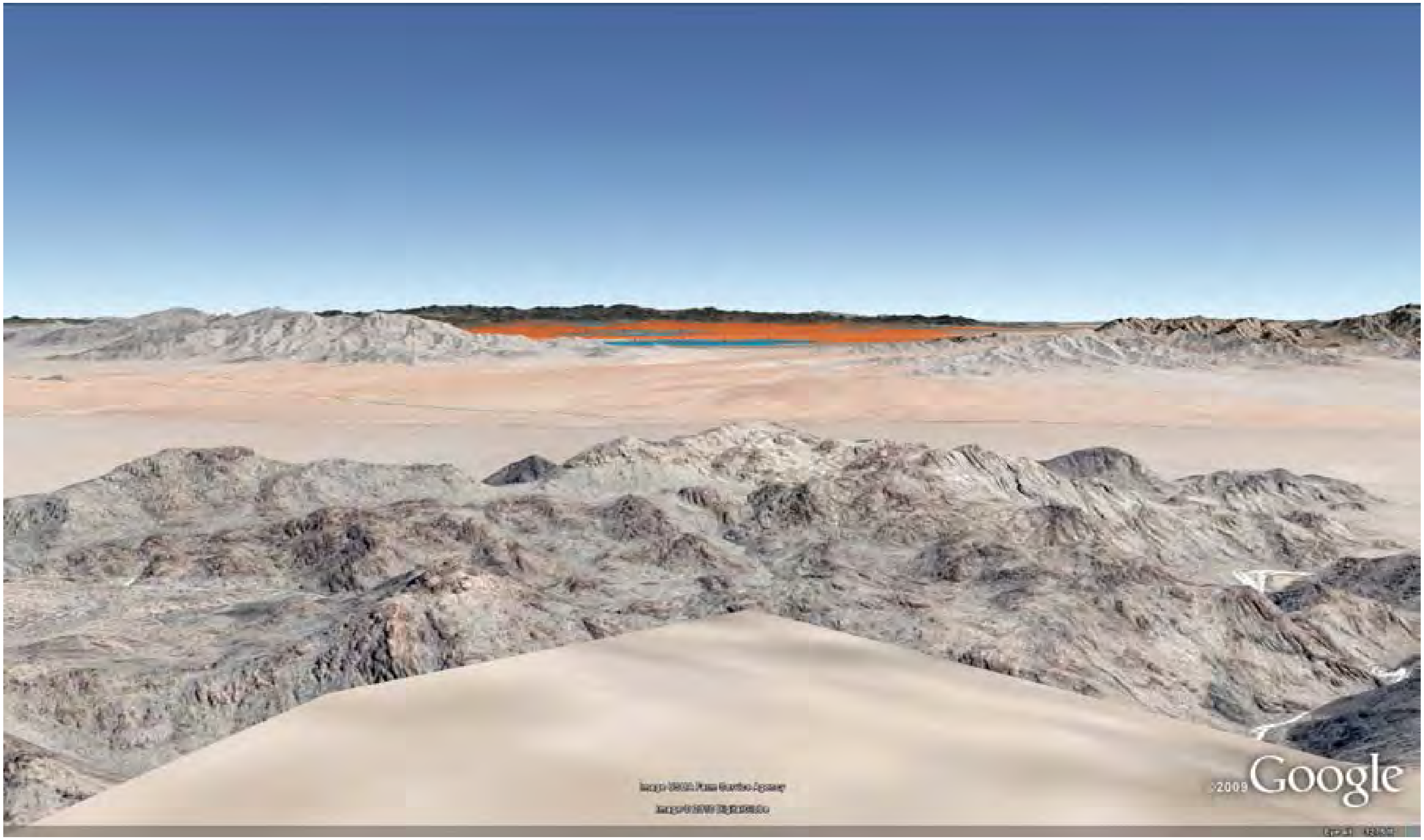

FIGURE 9.2.14.2-3 Google Earth Visualization of the Proposed Iron Mountain SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Viewpoint within Joshua Tree National Park

At night, if sufficiently tall, the power towers could have red or white flashing hazard navigation lights that would likely be visible in the national park and could attract attention, given the dark night skies in the vicinity of the SEZ. Other lighting associated with solar facilities in the SEZ could potentially be visible as well.

The range of contrasts from solar facilities within the SEZ that would be visible in the national park would be highly dependent on viewer location within the national park, especially with respect to the gap between the Iron Mountains and the Granite Mountains; these mountains restrict the view from many locations within the park. Under the 80% development scenario analyzed in this PEIS, solar facilities within the SEZ would be expected to create weak to moderate visual contrasts as viewed from the national park. The highest levels of visual contrast would be expected for viewing locations at higher elevations in the far northeastern portion of the park, with less visibility and lower contrast levels expected at lower elevations and/or more distant locations.

This location also has partial views of the much closer proposed Riverside East SEZ. Under the development scenario analyzed in this PEIS, solar energy development in the Riverside SEZ would be expected to result in much larger visual impacts than development within the Iron Mountain SEZ, when viewed from this and nearby locations within the national park, especially for those portions of the park closest to the Riverside East SEZ.

National Conservation Area

- *California Desert*—The CDCA is a 26-million-acre (105,000-km^2) parcel of land in southern California designated by Congress in 1976 through the Federal Land Policy and Management Act. About 10 million acres (40,000 km^2) of the CDCA is administered by the BLM. The proposed Iron Mountain SEZ is located within the CDCA.

  The CDCA management plan notes the "superb variety of scenic values" in the CDCA (BLM 1999) and lists scenic resources as needing management to preserve their value for future generations. The CDCA management plan divides CDCA lands into multiple-use classes based on management objectives. The class designations govern the type and degree of land use actions allowed within the areas defined by class boundaries. All land use actions and resource management activities on public lands within a multiple-use class delineation must meet the guidelines given for that class.

  Most of the proposed SEZ is classified as multiple-use class "M." This class provides for a wide variety of present and future uses, such as mining, livestock grazing, recreation, energy, and utility development. Class M management is also designed to conserve desert resources and to mitigate damage to those resources caused by permitted uses.

Two small portions of the SEZ along the eastern SEZ boundary and another very small parcel north of the Milligan town site are classified as multiple-use class “L.” Multiple-Use Class L (Limited Use) protects sensitive, natural, scenic, ecological, and cultural resource values. Public lands designated as Class L are managed to provide for generally lower intensity, carefully controlled multiple use of resources, while ensuring that sensitive values are not significantly diminished.

A larger area in the far northwestern portion of the SEZ is classified as multiple-use class “I.” Multiple-Use Class I is an “Intensive Use” class. Its purpose is to provide for concentrated use of lands and resources to meet human needs. Reasonable protection will be provided for sensitive natural and cultural values. Mitigation of impacts on resources and rehabilitation of affected areas will occur insofar as possible.

Utility-scale solar development within the SEZ would be an allowable use under the CDCA management plan for areas classified as multiple-use classes “M” and “I,” assuming mitigation measures would be used to minimize visual impacts. However, construction and operation of solar facilities under the PEIS development scenario would result in substantial visual impacts on the SEZ and some surrounding lands within the SEZ viewshed that could not be completely mitigated.

Portions of the CDCA within the 650-ft (198.1-m) viewshed for the Iron Mountain SEZ include approximately 821,521 acres [3,324.58 km^2], or 3.2% of the total CDCA acreage. Portions of the CDCA within the 24.6-ft (7.5-m) viewshed encompass approximately 708,349 acres (2,866.59 km^2), or 2.7% of the total CDCA acreage. Absent screening and other visibility factors that would prevent viewers from seeing solar energy facilities within the SEZ, all CDCA lands within the SEZ viewshed would be subject to visual impacts from solar development within the SEZ. The nature of the visual contrasts observed would vary with the distance from the SEZ, the angle of view, project numbers, sizes and locations, and other project- and site-specific factors.

Wilderness Areas

- *Whipple Mountains*—The Whipple Mountains Wilderness is a 78,484-acre (317.61 km^2) congressionally designated WA located 22 mi (36 km) at the point of closest approach east–northeast of the SEZ. The east–west oriented Whipple Mountains are the dominant land form within the WA. Hiking, horseback riding, hunting, camping, rock hounding, photography, and backpacking are popular recreational activities for visitors to the WA.

As shown in Figure 9.2.14.2-2, within 25 mi (40 km) of the SEZ, solar energy facilities within the SEZ could be visible from a very small part of the far western portion of the WA (approximately 97 acres [0.39 km^2]) in the 650-ft (198.1-m) viewshed, or 0.1% of the total WA acreage. There would be no visibility for the lower height viewsheds. Within the 25-mi (40-km) radius of analysis, the visible area of the WA extends 25 mi (40 km) from the eastern boundary of the SEZ. Limited visibility extends beyond 25 mi (40 km).

The viewshed analysis suggests that the upper portions of tall power tower receivers located in the extreme southeastern portion of the SEZ would be just visible through a notch in the far southern portion of the Turtle Mountains; however, because of the long distance to the SEZ and the low angle of view, visual impacts on the WA would be expected to be minimal. If one or more power towers were situated so that they were visible through the gap and the towers were of sufficient height, they could have red or white hazard navigation lighting that could potentially be visible at night.

- *Big Maria Mountains*—The Big Maria Mountains Wilderness is a 46,056-acre (186.38 km^2) congressionally designated WA located about 16 mi (25 km) at the point of closest approach southeast of the SEZ. The Big Maria Mountains contain gently sloping bajadas and rough, craggy peaks separated by steep canyons. Camping, hunting, hiking, backpacking, horseback riding, and wildlife viewing are recreational activities in the WA. There are no trails, but abandoned jeep tracks are used for hiking.

  As shown in Figure 9.2.14.2-2, within 25 mi (40 km) of the SEZ, solar energy facilities within the SEZ could be visible from much of the far northern portion of the WA and from scattered locations along the northern portion of the western boundary of the WA. Visible areas of the WA within the 25-mi (40-km) radius of analysis total approximately 8,974 acres (36.32 km^2) in the 650-ft (198.1-m) viewshed, or 19.5% of the total WA acreage, and 8,501 acres (34.40 km^2) in the 24.6-ft (7.5-m) viewshed, or 18.5% of the total WA acreage. The visible area of the WA extends approximately 23.8 mi (38.3 km) from the southeastern corner of the SEZ.

  Figure 9.2.14.2-4 is a Google Earth visualization of the SEZ as seen from an unnamed peak in the northwestern portion of the WA, approximately 18 mi (29 km) from the southeast portion of the SEZ. The viewpoint is about 2,400 ft (730 m) higher in elevation than the SEZ. The SEZ area is depicted in orange, the heliostat fields in blue.

  The upper slopes and peaks of the WA are sparsely vegetated, with little opportunity for screening, and a substantial portion of the SEZ would be

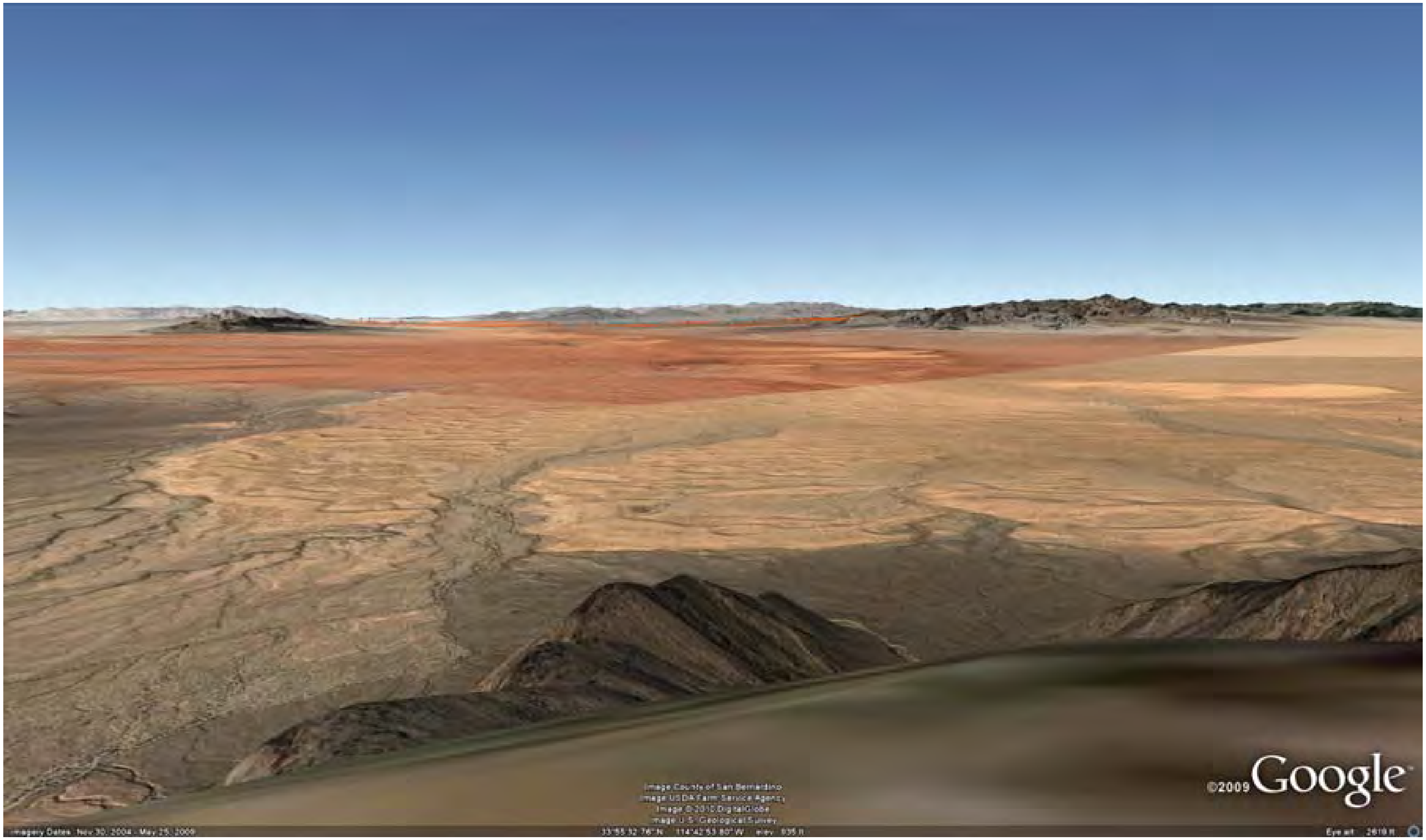

FIGURE 9.2.14.2-4 Google Earth Visualization of the Proposed Iron Mountain SEZ (shown in narrow orange and blue tinted band) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Viewpoint within the Big Maria Mountains WA

visible from this location. At the higher elevations within the WA, the angle of view would be great enough that the tops of solar collector/reflector arrays might be visible in some cases. However, because of the long distance to the SEZ, the angle of view would still be low enough that the arrays would repeat the line of the plain in which the SEZ is located and this would tend to reduce contrast. If power towers were present within the SEZ, when operating, the receivers would likely appear as distant points of light against the backdrop of the Iron and Old Woman Mountains. At night, if sufficiently tall, the power towers could have red or white flashing hazard navigation lights that would likely be visible in the WA and could attract attention, given the dark night skies in the vicinity of the SEZ.

The range of visual contrasts associated with solar facilities in the SEZ as observed from the WA would be highly dependent on viewer location within the WA and on project location and design. Under the 80% development scenario analyzed in this PEIS, solar facilities within the SEZ would be expected to create minimal to weak visual contrasts as viewed from the WA. The highest levels of visual contrast would be expected for viewing locations at higher elevations in the far northern portion of the WA, with less visibility and lower contrast levels expected at lower elevations.

This location also has a very open view of the much closer proposed Riverside East SEZ. Under the development scenario analyzed in this PEIS, solar energy development in the Riverside East SEZ would be expected to result in much larger visual impacts than development in the Iron Mountain SEZ, when viewed from this and nearby locations within the WA.

- *Stepladder Mountains*—The Stepladder Mountains Wilderness is an 84,187-acre (340.69-km^2) congressionally designated WA located about 15mi (24 km) at the point of closest approach north of the SEZ. The Stepladder Mountains are a bleak mountain range about 10 mi (14 km) in length north to south. Several trails cross the wilderness, accessible from along Turtle Mountain Road. Camping, hunting, hiking, backpacking, and wildlife viewing are recreational activities in the WA.

  As shown in Figure 9.2.14.2-2, within the 25-mi (40-km) radius of analysis, solar energy facilities within the SEZ could be visible from the far southern portion of the WA (approximately 12,833 acres [51.933 km^2] in the 650-ft [198.1-m] viewshed, or 15.2% of the total WA, and 9,307 acres [37.66 km^2] in the 24.6-ft [7.5-m] viewshed, or 11.1% of the total WA acreage). The visible area of the WA extends beyond 25 mi (40 km) from the northern boundary of the SEZ.

  Figure 9.2.14.2-5 is a Google Earth visualization of the SEZ as seen from an unnamed peak in the far southern portion of the WA, approximately 16 mi

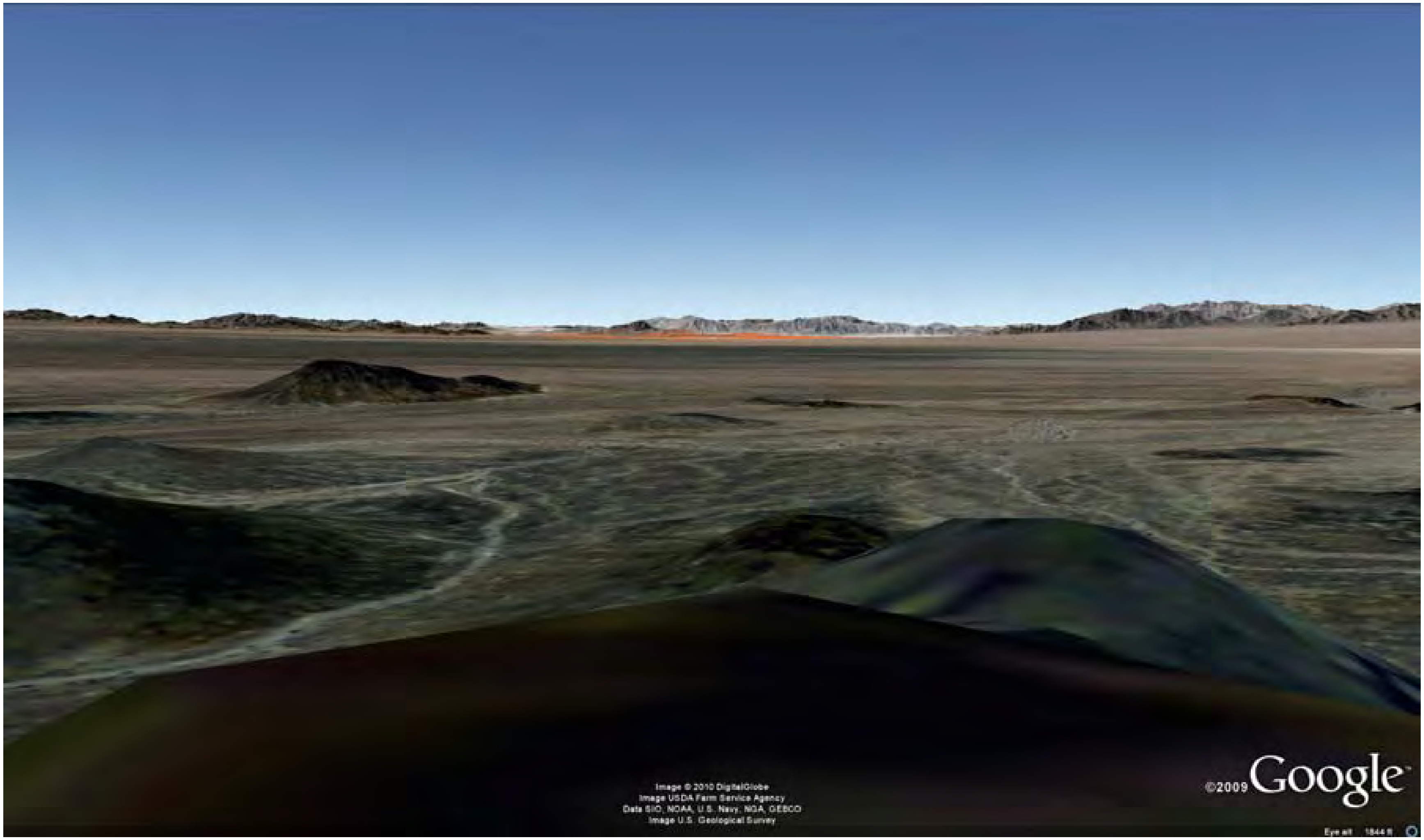

FIGURE 9.2.14.2-5 Google Earth Visualization of the Proposed Iron Mountain SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Viewpoint within the Stepladder Mountains WA

(26 km) from the northern boundary of the SEZ. The SEZ area is depicted in orange, the heliostat fields in blue.

The upper slopes and peaks of the WA are sparsely vegetated with little opportunity for screening, and the northwestern portion of the SEZ would be visible from this location. Despite the elevated viewpoint, the long distance to the SEZ would make the angle of view low enough that visible solar collector/reflector arrays within the SEZ would repeat the line of the plain in which the SEZ is located and this would tend to reduce contrast. If power towers were present within the SEZ, when operating, the receivers would likely appear as distant points of light against the backdrop of the Iron and Palen-McCoy Mountains.

At night, if sufficiently tall, the power towers could have red or white flashing hazard navigation lights that would likely be visible in the WA, and could be attract attention, given the dark night skies in the vicinity of the SEZ.

The range of impact would be highly dependent on viewer location within the WA and on project location and design. Under the 80% development scenario analyzed in this PEIS, solar facilities within the SEZ would be expected to create minimal to weak visual contrasts as viewed from the WA. The highest levels of visual contrast would be expected for viewing locations at higher elevations in the far southern portion of the WA, with less visibility and lower contrast levels expected at lower elevations.

- *Cadiz Dunes*—The Cadiz Dunes Wilderness is a 21,286-acre (86.141-km^2) congressionally designated WA located about 11 mi (17 km) at the point of closest approach northwest of the SEZ. The WA encompasses a major portion of the Cadiz Dune system and desert shrub lowlands just east of the dunes. The pristine nature of the dunes and the spring display of unique dune plants make the area popular for photography. Camping, hiking, backpacking, and wildlife viewing are recreational activities in the WA.

The upper portions of sufficiently tall power tower receivers in certain locations within the SEZ could be visible through notches in the Kilbeck Hills from scattered locations in the far northwestern portions of the WA (approximately 1,473 acres [5.961 km^2] in the 650-ft [198.1-m] viewshed, or 6.9% of the total WA acreage). The lower-height viewshed analyses indicate there would be no visibility for solar dishes, parabolic troughs, or PV collector arrays. The visible area of the WA extends approximately 18 mi (29 km) from the northwest corner of the SEZ.

The portions of the WA with views of the SEZ are lower in elevation than the nearest portions of the SEZ by 100 ft (30 m) or more, so the angle of view is very low. Because of the limited areas of visibility, very low angle of view, and the relatively long distance to the SEZ, visual impacts on the WA would be expected to be minimal.

- *Riverside Mountains*—The Riverside Mountains Wilderness is a 24,206-acre (97.958-km^2) congressionally designated WA located 13.7 mi (22.1 km) at the point of closest approach southeast of the SEZ. The WA includes the Riverside Mountains and bajadas descending to the Colorado River. Camping, hiking, backpacking, horseback riding, hunting, and wildlife viewing are recreational activities in the WA.

  As shown in Figure 9.2.14.2-2, solar energy facilities within the SEZ could be visible from some locations in the far western portion of the WA, from the peak of Riverside Mountain (about 21 mi [34 km] from the SEZ), and, for the upper portions of power tower receivers only, some locations within the WA farther east and higher than 2,000 ft (610 m) in elevation. Total WA acreage within the viewshed of the SEZ is approximately 818 acres (3.31 km^2) in the 650-ft (198.1-m) viewshed, or 3.4% of the total WA acreage, and 488 acres (1.97 km^2) in the 24.6-ft (7.5-m) viewshed, or 2.0% of the total WA acreage. The visible area of the WA extends approximately 21 mi (34 km) from the southeast boundary of the SEZ; however, the main area of visibility is located approximately 16mi (26 km) from the SEZ.

  The upper slopes and peaks of the WA are sparsely vegetated with little opportunity for screening, and the southeastern portion of the SEZ could be visible from these areas. However, because of the long distance to the SEZ, the angle of view is still low enough that solar arrays would repeat the line of the plain in which the SEZ is located, which would tend to reduce contrast. If power towers were present within the SEZ, when operating, the receivers would likely appear as distant points of light against the backdrop of the Iron Mountains and possibly against a sky backdrop between the Iron Mountains and the Old Woman Mountains. At night, if sufficiently tall, the power towers could have red or white flashing hazard navigation lights that would likely be visible in the WA and could attract attention, given the dark night skies in the vicinity of the SEZ.

  Under the 80% development scenario analyzed in this PEIS, solar facilities within the SEZ would be expected to create minimal to weak visual contrasts as viewed from the WA. The highest levels of visual contrast would be expected for viewing locations at higher elevations in the far western portion of the WA, with less visibility and lower contrast levels expected at lower elevations. From the area around Riverside Mountain, minimal to weak levels of visual contrast would be expected from solar energy facilities within the SEZ.

- *Joshua Tree*—The Joshua Tree Wilderness is a 586,623-acre (2,373.98-km^2) congressionally designated WA located entirely within Joshua Tree National

Park. Areas of the WA within the viewshed of the SEZ are identical to those for Joshua Tree National Park, and expected visual contrast levels are the same as those expected for the park (see above).

- *Sheephole Valley*—The Sheephole Valley Wilderness is a 195,002-acre (789.145-km^2) congressionally designated WA located about 11 mi (18 km) at the point of closest approach west of the SEZ. The WA includes the Sheephole Mountains, the Calumet Mountains, and the Sheephole Valley. The Sheepholes are a steep, boulder-strewn mountain range; the Calumets are similar but much lower. Camping, hiking, backpacking, hunting, and wildlife viewing are recreational activities in the WA.

  As shown in Figure 9.2.14.2-2, within 25 mi (40 km) of the SEZ, solar energy facilities within the SEZ could be visible from the eastern portion of the WA (approximately 25,278 acres [102.30 km^2] in the 1650-ft [98.1-m] viewshed, or 13.1% of the total WA acreage, and 17,889 acres [72.394 km^2] in the 7.5 m viewshed, or 9.2% of the total WA acreage). The visible area of the WA extends approximately 25 mi (40 km) from the northwestern boundary of the SEZ. Visible areas include the east-facing slopes of the Calumet Mountains, down to approximately 820 ft (250 m) in elevation at the lowest point on the eastern boundary of the WA.

  Figure 9.2.14.2-6 is a Google Earth visualization of the SEZ as seen from an unnamed peak in the east central portion of the WA, approximately 18 mi (29 km) from the western boundary of the SEZ. The viewpoint is about 2,700 ft (820 m) higher in elevation than the SEZ. The SEZ area is depicted in orange, the heliostat fields in blue.

  The upper slopes and peaks of the WA are sparsely vegetated with little opportunity for screening, and the far northern portion of the SEZ would be visible from this location; however, the Iron Mountains screen much of the view of the SEZ from this and most other locations within the WA. Despite the elevated viewpoint, the 18-mi (29-km) distance to the SEZ would result in an angle of view low enough that visible solar collector/reflector arrays within the SEZ would repeat the line of the plain in which the SEZ is located and this would tend to reduce contrast. If power towers were present within the SEZ, when operating, the receivers would likely appear as distant points of light against the backdrop of the valley floor or the Big Maria Mountains. The range of impact would be highly dependent on viewer location within the WA and on project location and design. Under the 80% development scenario analyzed in this PEIS, solar facilities within the SEZ would be expected to create minimal to weak visual contrasts as viewed from the WA. The highest levels of visual contrast would be expected for viewing locations at higher elevations in the WA, with less visibility and lower contrast levels expected at lower elevations.

FIGURE 9.2.14.2-6 Google Earth Visualization of the Proposed Iron Mountain SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Viewpoint within the Sheephole Valley WA

- *Rice Valley*—The Rice Valley Wilderness is a 43,412-acre (175.68-km^2) congressionally designated WA located 6.6 mi (10.6 km) at the point of closest approach southeast of the SEZ. The WA includes a portion of the broad, flat plains of Rice Valley, the northwestern tip of the Big Maria Mountains, and a system of small dunes rising 30 to 40 ft (9 to 12 m) above the valley floor. The valley is part of a massive sand sheet that extends from Cadiz Valley through Ward Valley. Camping, hiking, backpacking, hunting, and wildlife viewing are recreational activities in the WA.

  Solar energy facilities within the SEZ could potentially be visible from most of the WA (approximately 40,799 acres [165.11 km^2] in the 650-ft [198.1-m] viewshed, or 94% of the total WA acreage, and 40,329 acres [163.21 km^2] in the 24.6-ft [7.5-m] viewshed, or 92.9% of the total WA acreage). The visible area of the WA extends approximately 18.4 mi (29.6 km) from the southeast corner of the SEZ.

  Most of the Rice Valley WA is located on the Rice Valley floor, which slopes gently upward toward the south. The elevation in the northern portions of the WA is generally as low as or lower than the nearest part of the SEZ, especially in the northern portions of the WA.

  Figure 9.2.14.2-7 is a Google Earth visualization of the SEZ as seen from the Rice Valley floor in the far northwest portion of the WA, near the point of closest approach to the SEZ. The viewpoint is approximately 6.5 mi (10.5 km) from the southeast corner of the SEZ and is about 470 ft (140 m) higher in elevation than the SEZ. The SEZ area is depicted in orange, the heliostat fields in blue.

  The visualization suggests that solar facilities within the SEZ would be visible to the northwest through the gap between the Palen-McCoy Mountains to the west and the Turtle Mountains to the east. To the west, the Rice Valley floor rises enough to screen the western-most portions of the SEZ from view. The SEZ would occupy a moderate amount of the horizontal field of view, but the vertical angle of view would be very low. From this viewpoint, solar energy facilities within the SEZ would appear edge-on or nearly so, which would make the large areal extent and strong regular geometry of the collector/reflector arrays of solar facilities in the SEZ less apparent, and would cause the arrays to appear to repeat the strong line of the horizon, tending to reduce visual contrast.

  Tall power towers, power blocks, plumes, and transmission towers located in the nearest parts of the SEZ would add very short oblique and vertical lines and form elements that would likely project above the solar collector/reflector arrays and tend to increase visual contrast. Depending on project and viewer location, these elements could be viewed against a sky backdrop, the Turtle Mountains, the Old Woman Mountains, or the Iron Mountains.

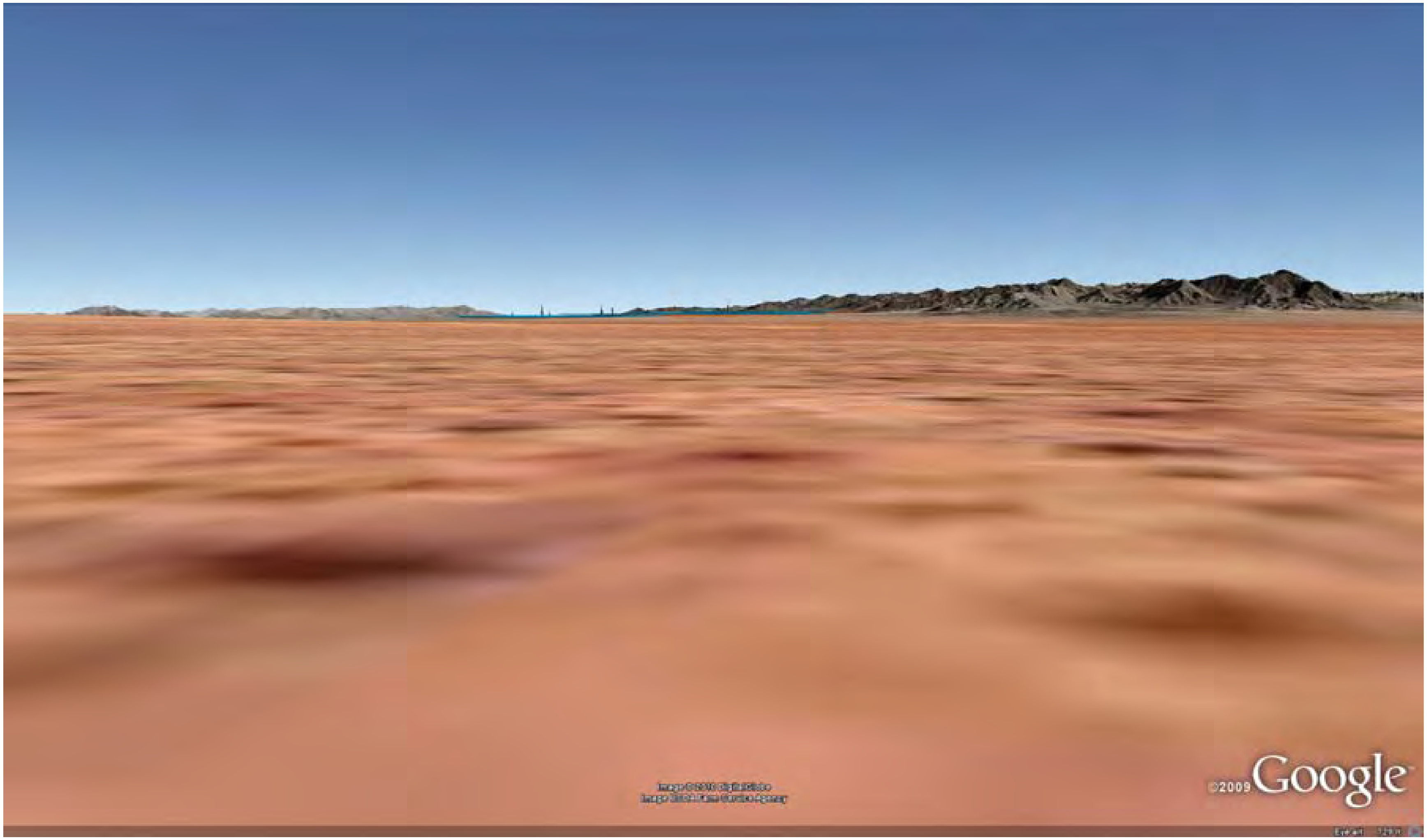

FIGURE 9.2.14.2-7 Google Earth Visualization of the Proposed Iron Mountain SEZ (shown in blue tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Viewpoint on Valley Floor within the Rice Valley WA

The receivers of operating power towers in nearby portions of the SEZ could appear as very bright non-point (i.e., having a cylindrical or rectangular shape) light sources atop discernable tower structures. They would be likely to attract visual attention. At night, if sufficiently tall, the power towers could have red or white flashing hazard navigation lights that would likely be visible in the WA and could be conspicuous from this viewpoint, given the dark night skies in the vicinity of the SEZ. Other lighting associated with solar facilities in the SEZ could potentially be visible as well.

The nature of the visual contrasts from solar facilities in the SEZ as observed from this viewpoint would depend on the numbers, types, sizes, and locations of solar facilities in the SEZ and on other project- and site-specific factors, but under the 80% development scenario analyzed in this PEIS, solar facilities within the SEZ would be expected to create moderate visual contrasts.

Figure 9.2.14.2-8 is a Google Earth visualization of the SEZ as seen from the far southwest portion of the WA, near the northwestern tip of the Big Maria Mountains. The viewpoint is the highest point in the WA, elevated about 2,100 ft (640 m) above the valley floor. The viewpoint is approximately 16 mi (26 km) from the southeast corner of the SEZ. The SEZ area is depicted in orange, the heliostat fields in blue.

The visualization suggests that from this elevated viewpoint, the tops of solar collector/reflector arrays would be visible. Most or all of the SEZ would be visible, but the angle of view would be low enough that visible solar collector/reflector arrays within the SEZ would repeat the line of the plain in which the SEZ is located, which would tend to reduce contrast. Taller solar facility components, such as transmission towers, could be visible, depending on lighting, but might not be noticed by casual observers.

If power towers were present within the SEZ, when operating, the receivers would likely appear as distant points of light against the backdrop of the valley floor or the bajadas of the Iron and Old Woman Mountains. At night, if sufficiently tall, the power towers could have red or white flashing hazard navigation lights that would likely be visible from the WA.

The range of impact would be highly dependent on viewer location within the WA and on the numbers, types, sizes, and locations of solar facilities in the SEZ, and other project- and site-specific factors, but under the 80% development scenario analyzed in this PEIS, solar facilities within the SEZ would be expected to create minimal to moderate visual contrasts as viewed from the WA. In general, the highest levels of visual contrast would be expected for viewing locations closest to the SEZ.

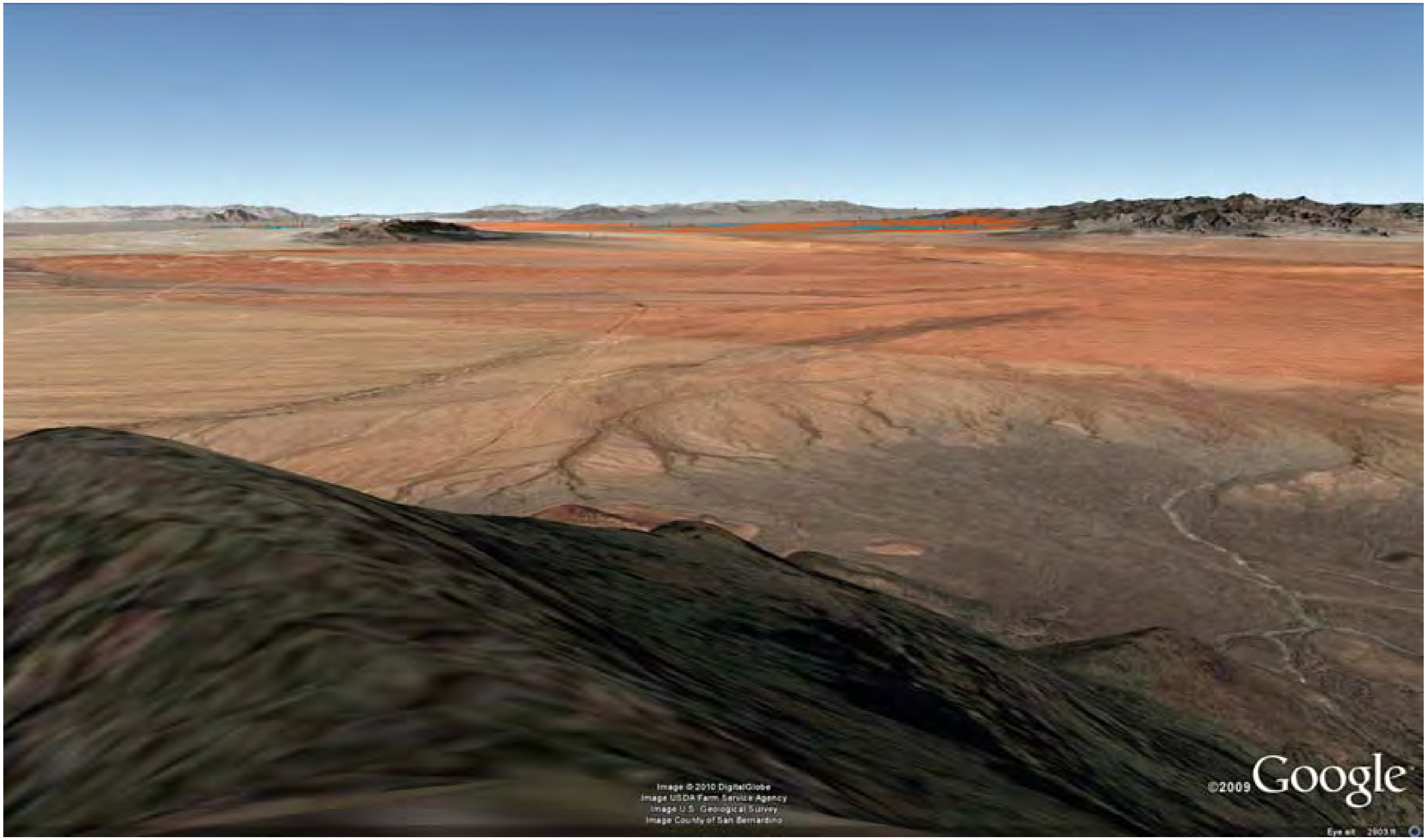

FIGURE 9.2.14.2-8 Google Earth Visualization of the Proposed Iron Mountain SEZ (shown in orange and blue tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from an Elevated Viewpoint within the Rice Valley WA

- *Palen-McCoy*—The Palen-McCoy Wilderness is a 224,414-acre (908.171-km^2) congressionally designated WA located 1.6 mi (2.6 km) at the point of closest approach directly south of the SEZ. The WA contains five separate mountain ranges separated by wide bajadas and encompasses several landscape types, from desert pavement, bajadas, interior valleys, and canyons to dense ironwood forests, steep canyons, and rugged peaks. Unlike most other WAs around the proposed SEZ, the Palen-McCoy WA extends beyond the mountains down the bajada and as much as 10 mi (16 km) out onto the valley floor. Camping, hiking, backpacking, horseback riding, hunting, and wildlife viewing are recreational activities in the WA.

  Solar energy facilities within the SEZ could be visible from much of the WA on the northeast sides of the Granite and Big Maria Mountains (approximately 60,341 acres [244.19 km^2] in the 650-ft [198.1-m] viewshed, or 26.9% of the total WA acreage, and 56,221 acres [227.52 km^2] in the 24.6-ft [7.5-m] viewshed, or 25.1% of the total WA acreage). The visible area of the WA extends approximately 16 mi (26 km) from the southern boundary of the SEZ.

  Figure 9.2.14.2-9 is a Google Earth visualization of the SEZ as seen from the highest peak in the Granite Mountains (unnamed), near the southern end of the mountain range. The viewpoint is the highest point in the WA, elevated about 3,400 ft (1,000 m) above the valley floor at the closest point within the SEZ. The viewpoint is approximately 7.3 mi (11.8 km) from the nearest point on the southern boundary of the SEZ. The nearest power towers in the visualization (at left) are about 9.2 mi (14.8 km) from the viewpoint. The SEZ area is depicted in orange; the heliostat fields in blue.

  The visualization suggests that from this elevated viewpoint the SEZ would be too large to be encompassed in one view, and viewers would need to turn their heads to scan across the whole SEZ. The tops of solar collector/reflector arrays in the closest parts of the SEZ would be visible, and depending on project size and layout, some facilities might not repeat the horizontal line of the valley plain. Because of the relatively high angle of view, the large areal extent, and the strong regular geometry of the collector/reflector arrays, solar facilities in the SEZ would be apparent, tending to increase contrast. The angle of view would be low enough that visible solar collector/reflector arrays in the northeast portion of the SEZ (farthest away from this viewpoint) would repeat the line of the plain in which the SEZ is located, which would tend to reduce contrast.

  Taller ancillary facilities, such as buildings, transmission structures, and cooling towers, and plumes (if present) could be visible, projecting above the collector/reflector arrays, at least for nearby facilities. The ancillary facilities could create form and line contrasts with the strongly horizontal, regular, and repeating forms and lines of the collector/reflector arrays.

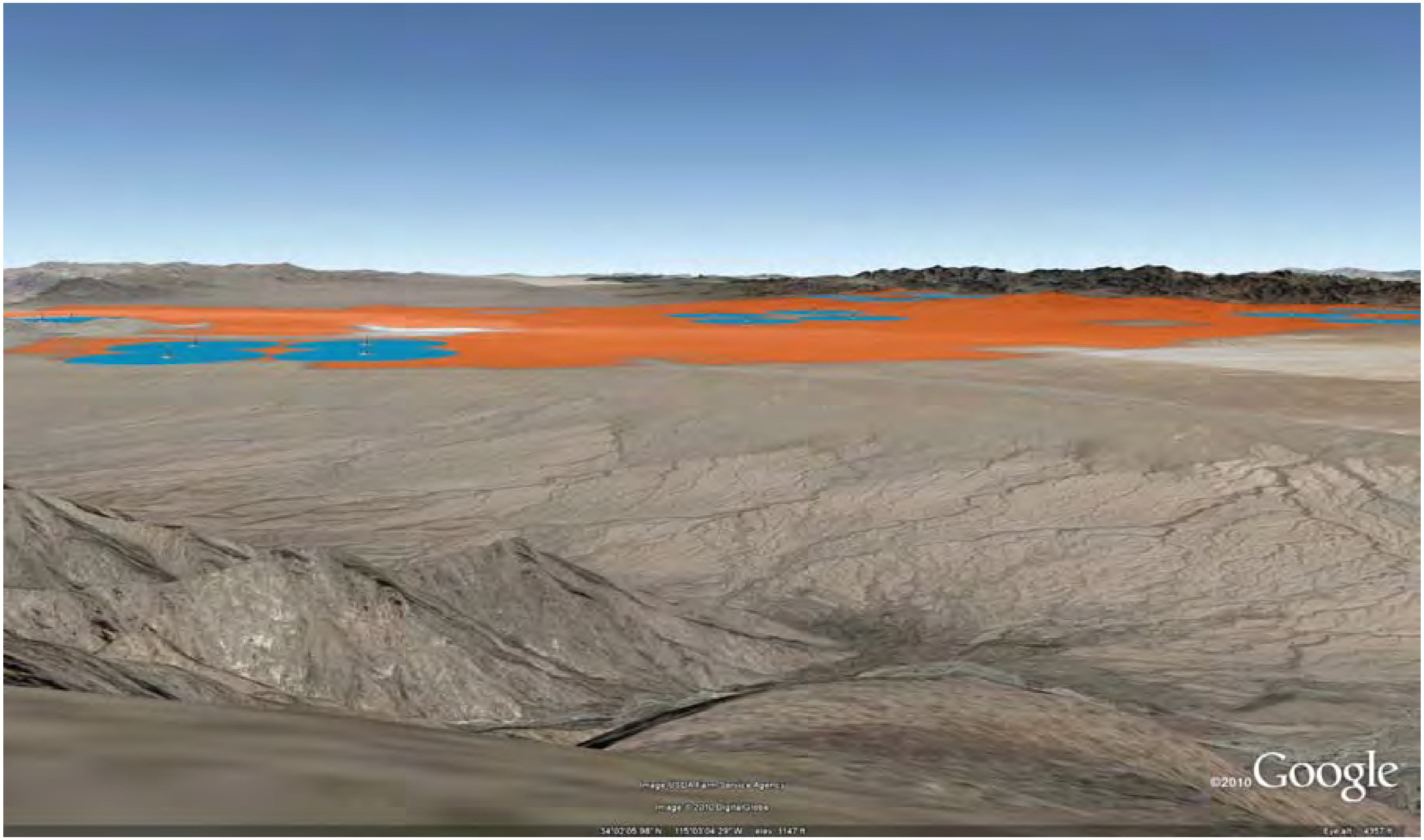

FIGURE 9.2.14.2-9 Google Earth Visualization of the Proposed Iron Mountain SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from the Granite Mountains in the Palen-McCoy WA

If power towers were present within the SEZ, when operating, the receivers of towers in the nearer parts of the SEZ would likely appear as bright points of light against the backdrop of the valley floor or the bajadas of the Turtle and Old Woman Mountains. At night, if sufficiently tall, the power towers could have red or white flashing hazard navigation lights that would likely be visible from the WA and could be conspicuous, given the dark night skies in the vicinity of the SEZ. Other lighting associated with solar facilities in the SEZ could potentially be visible as well.

The potential visual contrast expected for this viewpoint would vary depending on the numbers, types, sizes, and locations of solar facilities in the SEZ, and other project- and site-specific factors, but under the 80% development scenario analyzed in this PEIS, solar facilities within the SEZ would be expected to create strong visual contrasts as viewed from this location within the WA.

Figure 9.2.14.2-10 is a Google Earth visualization of the SEZ as seen from a ridge in the Arica Mountains in the northeast corner of the WA. The viewpoint is elevated about 1,200 ft (370 m) above the valley floor at the closest point within the SEZ. The viewpoint is approximately 3.8 mi (6.1 km) from the nearest point on the southern boundary of the SEZ. The nearest power tower in the visualization (at right) is about 6.5 mi (10.4 km) from the viewpoint. The SEZ area is depicted in orange, the heliostat fields in blue.

The visualization suggests that from this elevated viewpoint and relatively short distance to the SEZ, the SEZ would be too large to be encompassed in one view, and viewers would need to turn their heads to scan across the whole SEZ. The tops of solar collector/reflector arrays in the closest parts of the SEZ would be visible, but the angle of view is low enough that arrays in the more distant parts of the SEZ would be viewed nearly edge-on, which would make their large areal extent and regular geometry less apparent, and would cause them to appear to repeat the horizontal line of the valley plain.

Taller ancillary facilities, such as buildings, transmission structures, and cooling towers, and plumes (if present) would likely be visible, projecting above the collector/reflector arrays, at least for nearby facilities. The ancillary facilities could create form and line contrasts with the strongly horizontal, regular, and repeating forms and lines of the collector/reflector arrays. Color and texture contrasts would also be possible, but their extent would depend on the materials and surface treatments utilized in the facilities.

If power towers were present within the SEZ, when operating, the receivers of towers in the nearer parts of the SEZ would likely appear as very bright non-point (i.e., having a cylindrical or rectangular shape) against the backdrop of the valley floor or the bajadas of the Turtle and Old Woman Mountains. At night, if sufficiently tall, the power towers could have red or white flashing

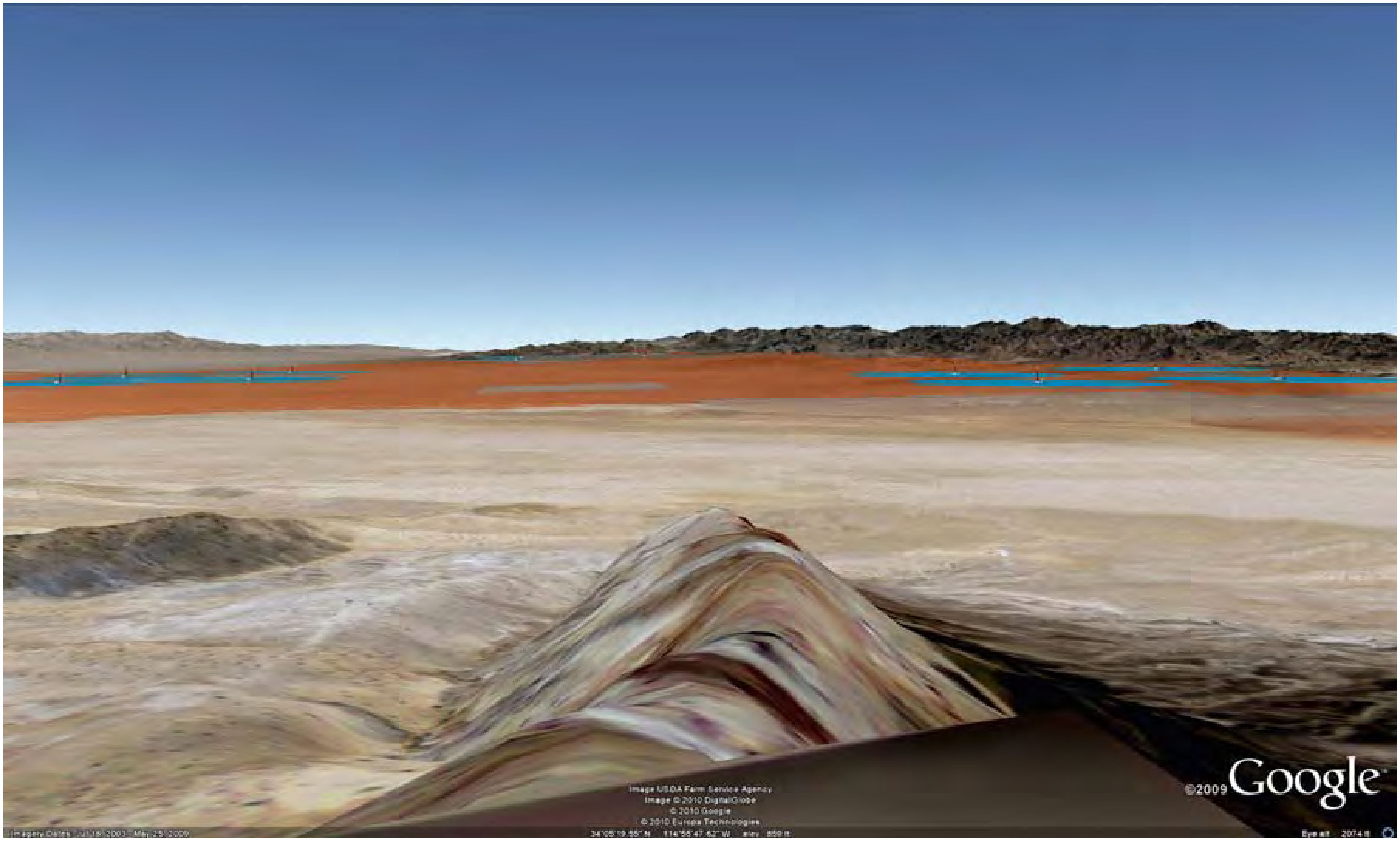

FIGURE 9.2.14.2-10 Google Earth Visualization of the Proposed Iron Mountain SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from the Arica Mountains in the Palen-McCoy WA

hazard navigation lights that would likely be visible from the WA and could be very conspicuous from this viewpoint, given the dark night skies in the vicinity of the SEZ. Other lighting associated with solar facilities in the SEZ would likely be visible as well.

The potential visual contrast expected for this viewpoint would vary depending on the numbers, types, sizes, and locations of solar facilities in the SEZ, and other project- and site-specific factors, but because the viewpoint is elevated and relatively close to the SEZ, the SEZ would stretch across much of the northern horizon. While one or a few solar facilities within the SEZ might only give rise to moderate levels of visual contrast, under the 80% development scenario analyzed in this PEIS, there could be numerous solar facilities within the SEZ, with a variety of technologies employed, and a range of supporting facilities that would contribute to visual impacts, such as transmission towers and lines, substations, power block components, and roads. Under the 80% development scenario analyzed in this PEIS, solar facilities within the SEZ would be expected to create strong visual contrasts as viewed from this location within the WA.

Figure 9.2.14.2-11 is a Google Earth visualization of the SEZ as seen in a typical view from the bajada below the Granite Mountains in the northeast corner of the SEZ. The viewpoint is elevated about 350 ft (107 m) above the valley floor at the closest point within the SEZ. The viewpoint is approximately 2.7 mi (4.4 km) from the nearest point on the southern boundary of the SEZ. The nearest power tower in the visualization (at left) is about 8.0 mi (12.8 km) from the viewpoint. The SEZ area is depicted in orange, the heliostat fields in blue.

The visualization suggests that from this relatively short distance to the SEZ, the SEZ would be too large to be encompassed in one view, and viewers would need to turn their heads to scan across the whole SEZ. Because of the relatively low elevation difference between the viewpoint and the SEZ, the vertical angle of view would be very low, and solar facilities in the SEZ would appear in a narrow band across the field of view. The collector/reflector arrays of solar facilities in the SEZ would be viewed nearly edge-on, which would make their large areal extent and regular geometry less apparent and would cause them to appear to repeat the horizontal line of the valley plain.

Taller ancillary facilities, such as buildings, transmission structures, and cooling towers; and plumes (if present) could be visible, projecting above the collector/reflector arrays, and their structural details could be evident, at least for nearby facilities. The ancillary facilities could create form and line contrasts with the strongly horizontal, regular, and repeating forms and lines of the collector/reflector arrays. Color and texture contrasts would also be possible, but their extent would depend on the materials and surface treatments utilized in the facilities.

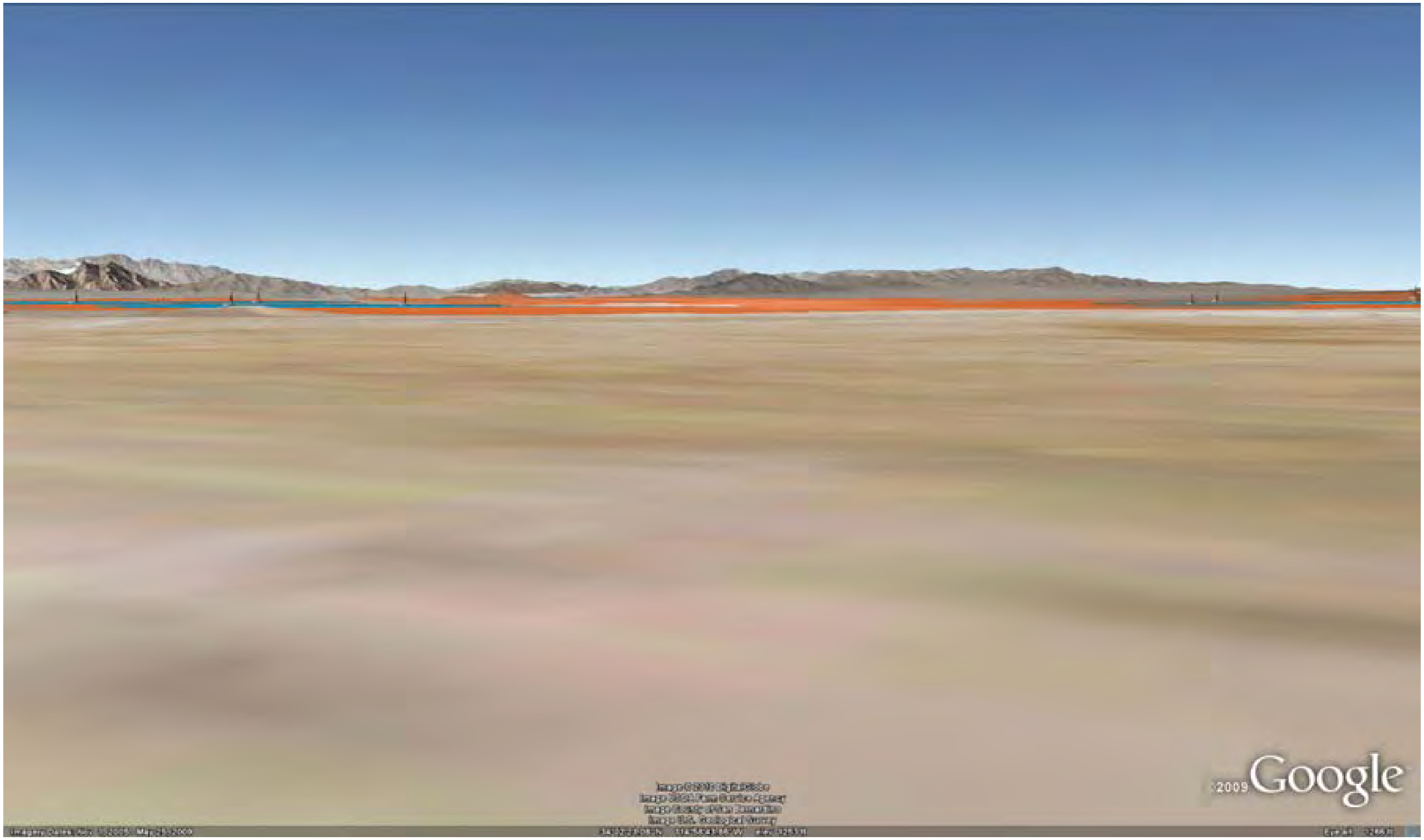

FIGURE 9.2.14.2-11 Google Earth Visualization of the Proposed Iron Mountain SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Granite Mountains Bajada in the Palen-McCoy WA

If power towers were present within the SEZ, when operating, the receivers of towers in the nearer parts of the SEZ would likely appear as very bright non-point (i.e., having a cylindrical or rectangular shape) against the backdrop of the valley floor or the bajadas of the Turtle and Old Woman Mountains. At night, if sufficiently tall, the power towers could have red or white flashing hazard navigation lights that would likely be visible from the WA and could be very conspicuous from this viewpoint, given the dark night skies in the vicinity of the SEZ. Other lighting associated with solar facilities in the SEZ would likely be visible as well.

The potential visual contrast expected for viewpoints on the bajadas would vary depending on viewpoint location and on facility numbers, locations, and designs as well as on other visibility factors. From some locations at lower elevations, slight variations in topography could screen much of the view of the SEZ, and weak levels of visual contrast might result if the angle of view was sufficiently low. Where there was a clear view of the SEZ from the bajada, under the 80% development scenario analyzed in this PEIS, moderate to strong levels of visual contrast might be observed.

In summary, the Palen-McCoy WA is very close to the SEZ, and many locations within the WA could have clear views of solar facilities in the SEZ across much of the field of view to the north of the WA. Given that there could be numerous solar facilities within the SEZ, with a variety of technologies employed, and a range of supporting facilities that would contribute to visual impacts, such as transmission towers and lines, substations, power block components, and roads, the resulting visually complex landscape would be essentially industrial in appearance and would contrast greatly with the surrounding mostly natural-appearing landscape. Under the 80% development scenario analyzed in this PEIS, strong levels of visual contrast from solar facilities within the SEZ could be observed from many locations within the WA, especially from elevated viewpoints.

- *Old Woman Mountains*—The Old Woman Mountains Wilderness is a 183,555-acre (742.821-km^2) congressionally designated WA. The southern edge of the Old Woman Mountains WA is adjacent to the northwest section of the SEZ. The Old Woman Range encompasses three ecosystems and includes the 5,300-ft (1,600-m) summit of Old Woman Peak. The WA contains trails and old mining roads used for hiking and backpacking. Camping, horseback riding, hunting, and wildlife viewing are other recreational activities in the WA.

  As shown in Figure 9.2.14.2-2, solar energy facilities within the SEZ could be visible from much of the northwest portion of the WA (approximately 88,760 acres [359.20 km^2] in the 650-ft [198.1-m] viewshed, or 48.4% of the total WA acreage, and 83,900 acres [339.53 km^2] in the 24.6-ft [7.5-m] viewshed, or 45.7% of the total WA acreage). The main area of the WA with potential visibility of solar facilities in the SEZ extends approximately 17 mi (27 km) from the far northern boundary of the SEZ, with a few small areas of visibility out to approximately 21 mi (34 km).

The Old Woman Mountains are a north-to-south oriented mountain range, roughly wedge-shaped, with the point of the wedge immediately north of the northwest corner of the SEZ. SEZ visibility on the western side of the Old Woman Mountains is limited to the far western portions of the SEZ, generally west of Danby Lake. The east-facing slopes of the Old Woman Mountains have views of nearly the entire SEZ. The mountains rise abruptly just north of the abandoned town of Milligan, and the WA's southern boundary is less than 0.5 mi (0.8 km) north of the town site. Most views of the SEZ from within the WA would be from more or less elevated viewpoints and, if viewed from the southern end of the mountain range, are very close to the SEZ. Because the SEZ is adjacent to the WA at the south end of the Old Woman Mountains, many of the visible areas at the southern end of the range would be within the BLM-designated foreground–middleground distance of 3 to 5 mi (4.8 to 8 km).

Figure 9.2.14.2-12 is a Google Earth visualization of the SEZ as seen from an unnamed peak in the Old Woman Mountains, elevated about 2,700 ft (820 m) above the valley floor at the closest point within the SEZ and approximately 4.1 mi (6.6 km) from the nearest point on the northern boundary of the SEZ. The SEZ area is depicted in orange, the heliostat fields in blue.

The visualization suggests that from this elevated viewpoint and relatively short distance to the SEZ, the SEZ would be too large to be encompassed in one view, and viewers would need to turn their heads to scan across the whole SEZ. Five clusters of power tower facility models are visible: the left-most model cluster is approximately 16 mi (26 km) from the viewpoint; the center model cluster is 15 mi (24 km) from the viewpoint; and the right-most model cluster is 10 mi (16 km) from the viewpoint (all distances to center points of model clusters). The tops of solar collector/reflector arrays in the closest parts of the SEZ would be visible, but the angle of view is low enough that arrays in the more distant parts of the SEZ would be seen nearly edge-on, which would make their large areal extent and regular geometry less apparent, as well as make them appear to repeat the horizontal line of the valley plain. If power towers were present within the SEZ, when operating, the receivers would likely appear as distant points of light against the backdrop of the valley floor or the bajada of the Turtle Mountains.

The potential visual contrast expected for this view point would vary depending on project locations, technologies, and site designs, but because the viewpoint is elevated and relatively close to the SEZ, the SEZ would occupy much of the field of view. Under the 80% development scenario analyzed in this PEIS, there could be numerous solar facilities within the SEZ, with a

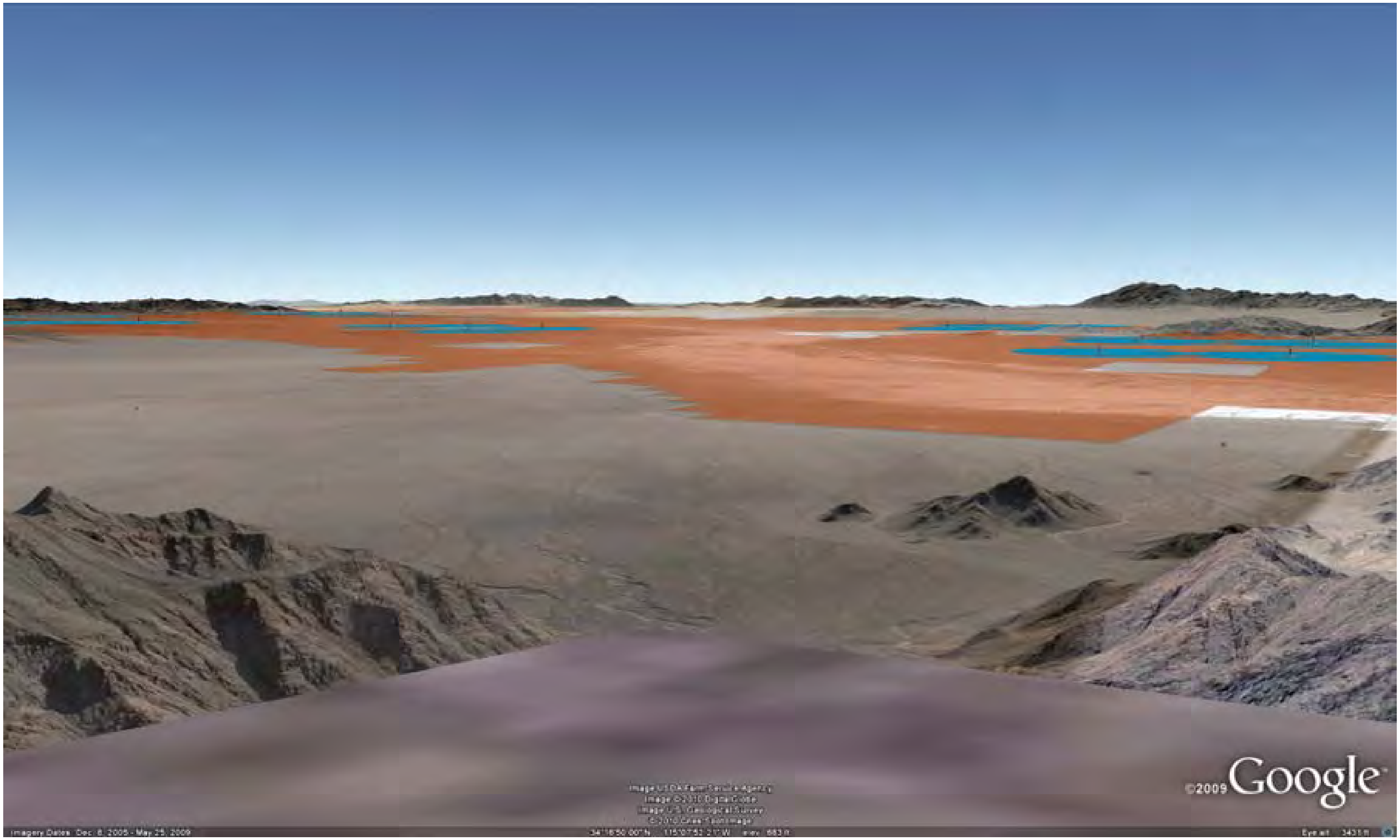

FIGURE 9.2.14.2-12 Google Earth Visualization of the Proposed Iron Mountain SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from a Peak in the Old Woman Mountains WA

variety of technologies employed, and a range of supporting facilities that would contribute to visual impacts, such as transmission towers and lines, substations, power block components, and roads. The resulting visually complex landscape could potentially dominate the view from this location. Under the PEIS development scenario, solar facilities within the SEZ would be expected to create moderate to strong visual contrasts as viewed from this location within the WA.

Figure 9.2.14.2-13 is a Google Earth visualization of the SEZ as seen from a much lower unnamed peak in the Old Woman Mountains, at the southern end of the range. The viewpoint is elevated about 860 ft (260 m) above the valley floor at the closest point within the SEZ and approximately 1.4 mi (2.3 km) from the nearest point on the northern boundary of the SEZ.

The visualization suggests that from this elevated viewpoint and very short distance to the SEZ, the SEZ would be too large to be encompassed in one view, and viewers would need to turn their heads to scan across the whole SEZ. Four clusters of power tower facility models are visible: the closer of the left two model clusters is approximately 13.5 mi (21.7 km) from the viewpoint, and the closer of the right two model clusters is 7.3 mi (11.8 km) from the viewpoint (all distances to center points of model clusters). The tops of solar collector/reflector arrays in the closest parts of the SEZ would be visible, but the angle of view is low enough that most facilities would repeat the horizontal line of the valley plain.

Taller ancillary facilities, such as buildings, transmission structures, and cooling towers; and plumes (if present) would likely be visible, projecting above the collector/reflector arrays, at least for nearby facilities. The ancillary facilities could create form and line contrasts with the strongly horizontal, regular, and repeating forms and lines of the collector/reflector arrays. Color and texture contrasts would also be possible for closer facilities, but their extent would depend on the materials and surface treatments utilized in the facilities.

If power towers were present within the SEZ at the distances shown in the visualization, when operating, the receivers would likely appear as points of light against the sky, against the backdrop of the valley floor or against the bajadas of the Iron or Turtle Mountains. Power towers located in the nearest portions of the SEZ could be much brighter and would be likely to strongly attract visual attention from this viewpoint. At night, if sufficiently tall, the power towers could have red or white flashing hazard navigation lights that would likely be visible from this viewpoint and could be very conspicuous, given the dark night skies in the vicinity of the SEZ. Other lighting associated with solar facilities in the SEZ could potentially be visible as well.

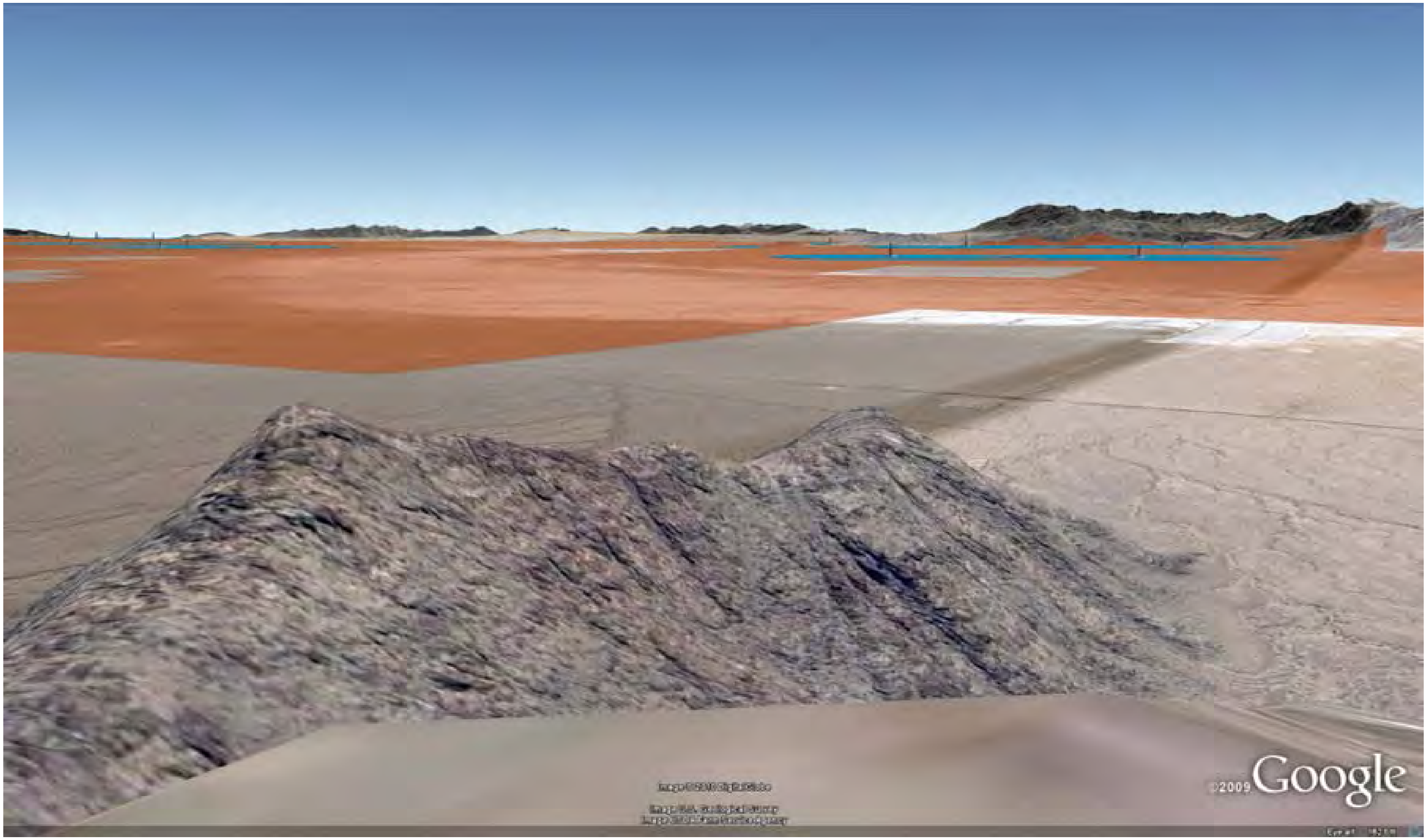

FIGURE 9.2.14.2-13 Google Earth Visualization of the Proposed Iron Mountain SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from a Peak in the Southern Portion of the Old Woman Mountains WA

The potential visual contrast expected for this viewpoint would vary depending on the numbers, types, sizes, and locations of solar facilities in the SEZ, and on other project- and site-specific factors, but because the view point is elevated and very close to the SEZ, the SEZ would occupy most of the field of view, and under the 80% development scenario analyzed in this PEIS, solar facilities within the SEZ would likely dominate the view from this location, and strong visual contrast levels would be expected.

In summary, because there could be numerous solar facilities within the SEZ, with a variety of technologies employed, and a range of supporting facilities that would contribute to visual impacts, a visually complex, man-made appearing industrial landscape could result. This essentially industrial-appearing landscape would contrast greatly with the surrounding natural-appearing lands and would be expected to create strong visual contrasts as viewed from many locations within the WA. Weaker levels of contrast would be expected for lower elevation viewpoints in the WA, many of which would have partially screened views of solar facilities in the SEZ.

- *Turtle Mountains*—The Turtle Mountains Wilderness is a 182,610-acre (738.996-km^2) congressionally designated WA. The southwest boundary of Turtle Mountains WA is adjacent to the eastern edge of the SEZ. Above broad, open bajadas, the WA's eroded volcanic peaks, spires, and cliffs in a range of colors constitute a diverse scenic landscape, which includes the Turtle Mountains scenic ACEC and the Turtle Mountains NNL. The WA contains numerous trails. The WA also contains the Mopah Peaks, which are rhyodactic or volcanic plugs, and the northern-most peak in the WA is a landmark known as Mexican Hat. Hiking, horseback riding, hunting, camping, rock hounding, photography, and backpacking are popular recreation activities within the WA. Coffin, Mopah, and Mohawk Springs are popular hiking destinations.

  As shown in Figure 9.2.14.2-2, solar energy facilities within the SEZ could be visible from much of the northwest portion of the WA (approximately 73,092 acres [295.79 km^2] in the 650-ft [198.1-m] viewshed, or 40% of the total WA acreage, and 63,275 acres [256.06 km^2] in the 24.6-ft [7.5-m] viewshed, or 35% of the total WA acreage). The visible area of the WA extends approximately 17 mi (27 km) from the northern boundary of the SEZ and approximately 5 mi (8 km) from the eastern boundary.

  The Turtle Mountains WA includes most of the Turtle Mountains range and a large portion of the Ward Valley floor to the northwest of the Turtle Mountains. The WA thus has both elevated and non-elevated views of the SEZ, and viewing distances range from 0 to 17 mi (0 to 27 km). The SEZ in its entirety is visible from the western slopes of the Turtle Mountains, and large portions of the SEZ are visible from the Ward Valley floor within the WA. Because the SEZ is adjacent to the WA near the Turtle Mountains, most of the visible areas in the mountains are within the BLM-designated foreground–middleground distance of 3 to 5 mi (4.8 to 8 km). Most of the views from the valley floor within the WA are beyond 5 mi (8 km).

Figure 9.2.14.2-14 is a Google Earth visualization of the SEZ as seen from an unnamed peak in the Turtle Mountains, elevated about 1,400 ft (430 m) above the bajada at the closest point within the SEZ and 2,400 ft (730 m) above the lowest point in the SEZ. The viewpoint is approximately 1.4 mi (2.3 km) from the nearest point on the eastern boundary of the SEZ. The SEZ area is depicted in orange, the heliostat fields in blue.

The visualization suggests that from this elevated viewpoint and very short distance to the SEZ, the SEZ would be too large to be encompassed in one view, and viewers would need to turn their heads to scan across the whole SEZ. Four clusters of power tower facility models are visible: the left-most model cluster is approximately 15 mi (24 km) from the viewpoint; the left-center model cluster is 8 mi (13 km) from the viewpoint; the right-center model cluster is 17 mi (27 km) from the viewpoint; and the right-most model cluster is 5 mi (8 km) from the viewpoint (all distances to center points of model clusters).

The tops of solar collector/reflector arrays in the closest parts of the SEZ would be visible, and the angle of view is high enough that these closer facilities would not repeat the horizontal line of the valley plain. Because of the oblique angle of view, the facilities would appear larger in areal extent than from less elevated viewpoints at the same distance.

Taller ancillary facilities, such as buildings, transmission structures, and cooling towers; and plumes (if present) would likely be visible, projecting above the collector/reflector arrays, and their structural details could be evident, at least for nearby facilities. The ancillary facilities could create form and line contrasts with the strongly horizontal, regular, and repeating forms and lines of the collector/reflector arrays. Color and texture contrasts would be possible, but their extent would depend on the materials and surface treatments utilized in the facilities.

If power towers were present within the nearest parts of the SEZ, when operating, the receivers would likely appear as very bright non-point (i.e., having a cylindrical or rectangular shape) point light sources atop discernable tower structures against the backdrop of the valley floor. Operating power towers in the most distant parts of the SEZ would likely appear as star-like points of light against the backdrop of the bajada of the Iron Mountains. At night, if sufficiently tall, the power towers could have red or white flashing hazard navigation lights that would be visible from this viewpoint and could be very conspicuous, given the dark night skies in the

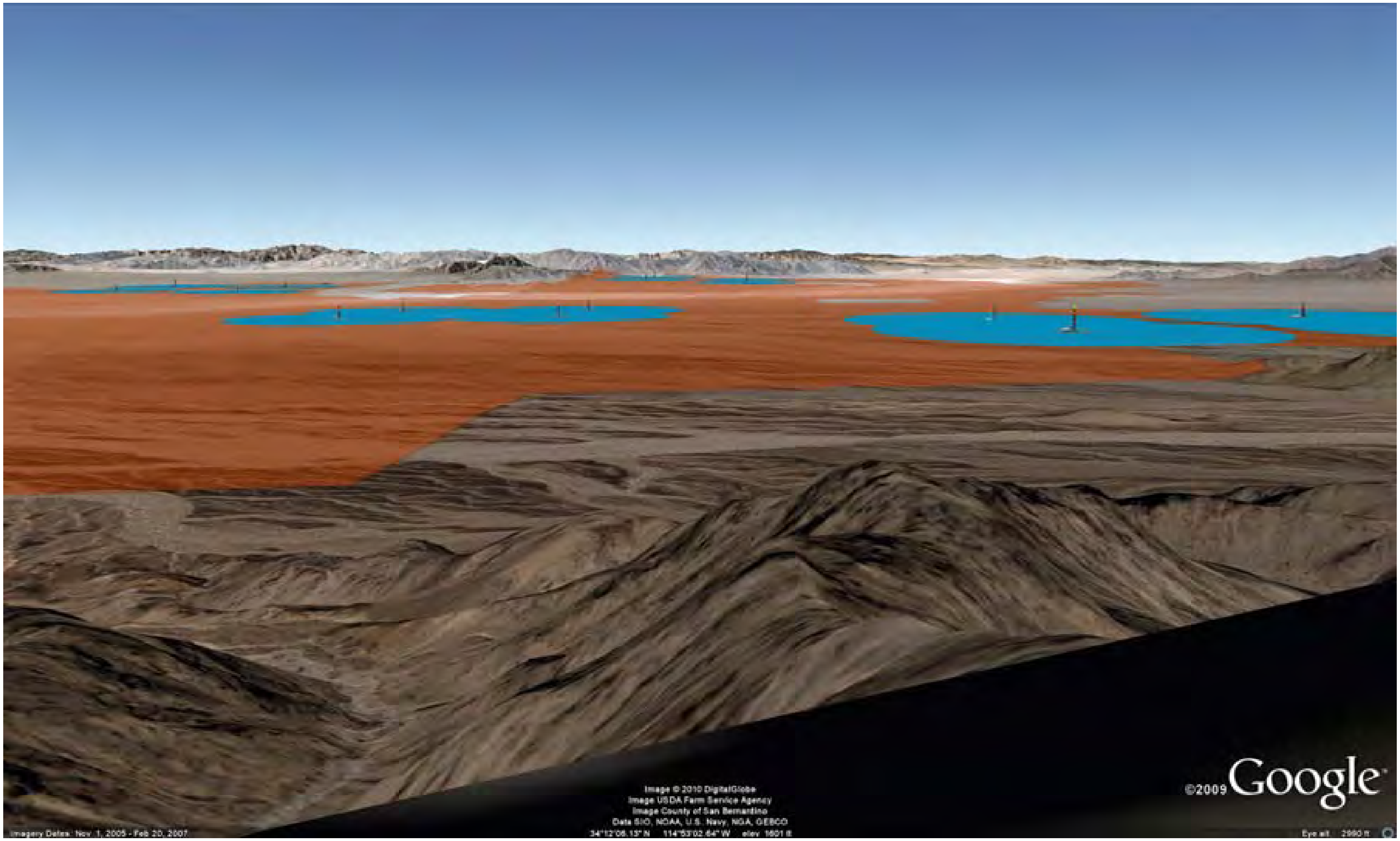

FIGURE 9.2.14.2-14 Google Earth Visualization of the Proposed Iron Mountain SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from a Peak in the Western Portion of the Turtle Mountains WA

vicinity of the SEZ. Other lighting associated with solar facilities in the SEZ could potentially be visible as well.

The potential visual contrast expected for this viewpoint would vary depending on the numbers, types, sizes, and locations of solar facilities in the SEZ and on other project- and site-specific factors, but because the viewpoint is elevated and very close to the SEZ, the SEZ would occupy most of the field of view. Under the 80% development scenario analyzed in this PEIS, , solar facilities within the SEZ would likely dominate the view from this location and would be expected to create strong visual contrasts as viewed from this location within the WA.

Figure 9.2.14.2-15 is a Google Earth visualization of the SEZ as seen from an unnamed peak in the Turtle Mountains, near the eastern limit of the visible area within the Turtle Mountains and elevated about 3,300 ft (1,000 m) above the lowest point in the SEZ. The viewpoint is approximately 4.6 mi (7.4 km) from the nearest point on the eastern boundary of the SEZ. The SEZ area is depicted in orange, the heliostat fields in blue.

The visualization suggests that from this elevated viewpoint and short distance to the SEZ, the SEZ would occupy nearly the entire horizontal field of view. Five clusters of power tower facility models are visible: the left-most model cluster is approximately 8 mi (13 km) from the viewpoint; the center model cluster is 18 mi (29 km) from the viewpoint; the right-center model cluster is 11 mi (18 km) from the viewpoint; the distant-right model cluster is 19 mi (31 km)distant; and the right-most, partially visible model cluster is 7 mi (12 km) from the viewpoint (all distances to center points of model clusters).

In this view, the Turtle Mountains west of the viewpoint screen some of the far eastern part of the Ward Valley and could screen solar facilities in the far eastern part of the SEZ. For facilities that are sufficiently far west in the SEZ to avoid screening, the tops of solar collector/reflector arrays could be visible, and the angle of view is high enough that these closer facilities might not repeat the horizontal line of the valley plain. Because of the oblique angle of view, the closer facilities would appear larger in areal extent than they would from less elevated viewpoints at the same distance, and the strong regular geometry of the arrays would be apparent.

Taller ancillary facilities, such as buildings, transmission structures, and cooling towers; and plumes (if present) would likely be visible, projecting above the collector/reflector arrays. The ancillary facilities could create form and line contrasts with the strongly horizontal, regular, and repeating forms and lines of the collector/reflector arrays. Color and texture contrasts would be possible for closer facilities, but their extent would depend on the materials and surface treatments utilized in the facilities.

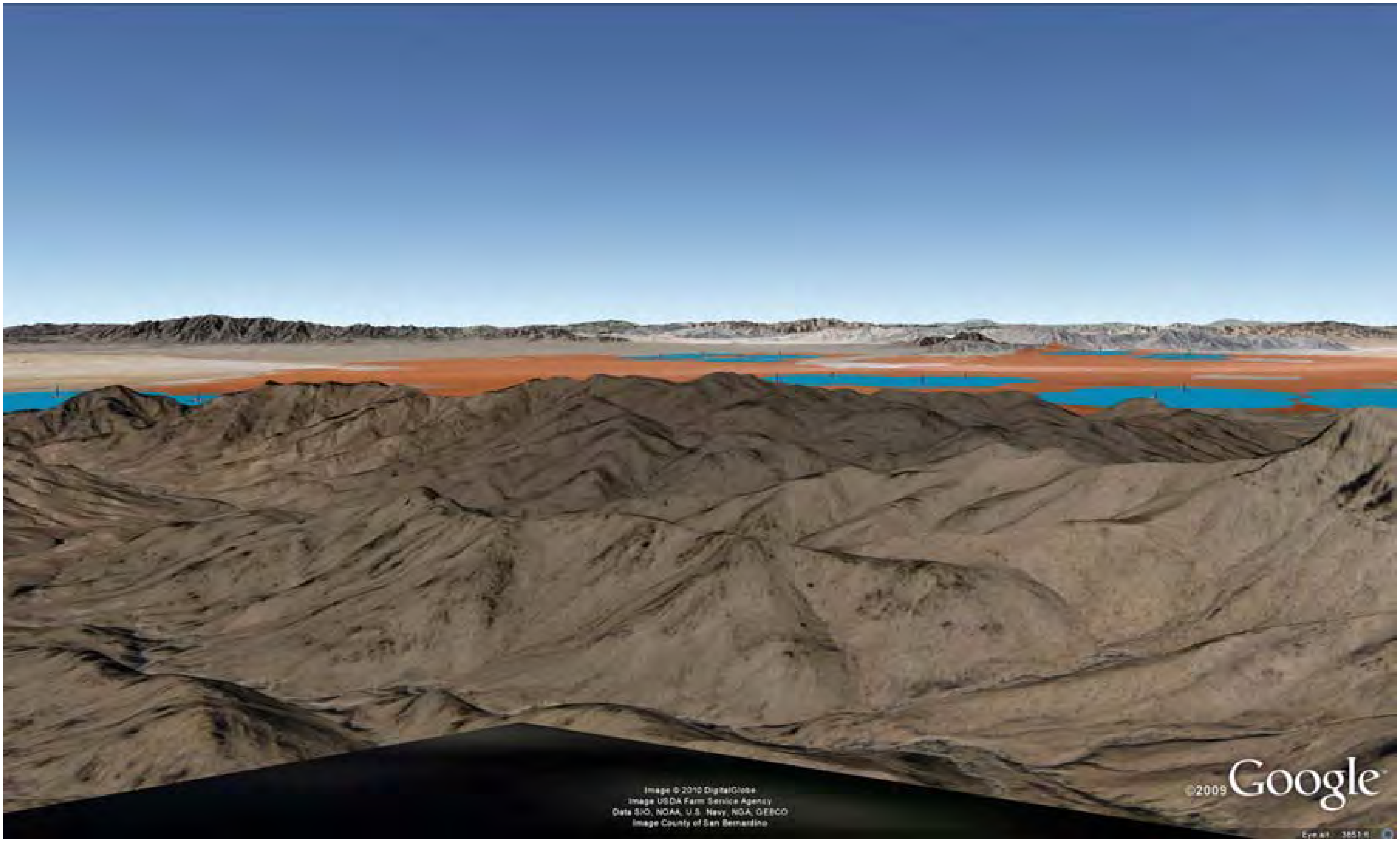

FIGURE 9.2.14.2-15 Google Earth Visualization of the Proposed Iron Mountain SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from a Peak in the Eastern Portion of the Turtle Mountains WA

If power towers were present within the SEZ, when operating, the receivers would likely appear as points of light against the backdrop of the valley floor or the bajada of the Iron Mountains. At night, if sufficiently tall, the power towers could have red or white flashing hazard navigation lights that would likely be visible from this location and could be conspicuous, given the dark night skies in the vicinity of the SEZ. Other lighting associated with solar facilities in the SEZ could potentially be visible as well.

The potential visual contrast expected for this viewpoint would vary depending on the numbers, types, sizes and locations of solar facilities in the SEZ, and other project- and site-specific factors, but because the viewpoint is elevated and close to the SEZ, the SEZ would occupy a significant portion of the field of view, even with the foreground screening from the mountains to the west of the viewpoint. Under the 80% development scenario analyzed in this PEIS, solar facilities within the SEZ would likely strongly attract visual attention, could potentially dominate the view from this location, and would be expected to create strong visual contrasts as viewed from this location within the WA.

Figure 9.2.14.2-16 is a Google Earth visualization of the SEZ as seen from within the WA on the floor of Ward Valley, north of the northeastern portion of the SEZ. The viewpoint is approximately 8 mi (13 km) from the nearest point on the northern boundary of the SEZ.

The visualization suggests that from this viewpoint the SEZ would be too large to be encompassed in one view, and viewers would need to turn their heads to scan across the whole SEZ. The bajada of the Turtle Mountains would screen views of the far eastern portion of the SEZ, but the upper portions of sufficiently tall power tower receivers might project beyond the surface of the bajada, depending on their location. Three clusters of power tower facility models are visible. For the left-most model cluster, only the upper portion of the power tower receivers is visible; the cluster is approximately 13 mi (21 km) from the viewpoint. The center model cluster is 17 mi (27 km) from the viewpoint, and the right-most model cluster is 14 mi (23 km) from the viewpoint (all distances to center points of model clusters).

In this view, the bajada of the Turtle Mountains southeast of the viewpoint screens some of the far eastern part of the Ward Valley and could screen solar development in that area. For facilities sufficiently far west in the SEZ to avoid screening, the angle of view is low enough and the SEZ distant enough that solar collector facilities would appear as thin horizontal bands close to the horizon and repeat the strong horizontal line of the valley plain. Power tower receivers, power blocks, transmission towers, and other relatively tall structures could be visible above the solar collector/reflector arrays and would add short vertical line contrasts to the strongly horizontal landscape.

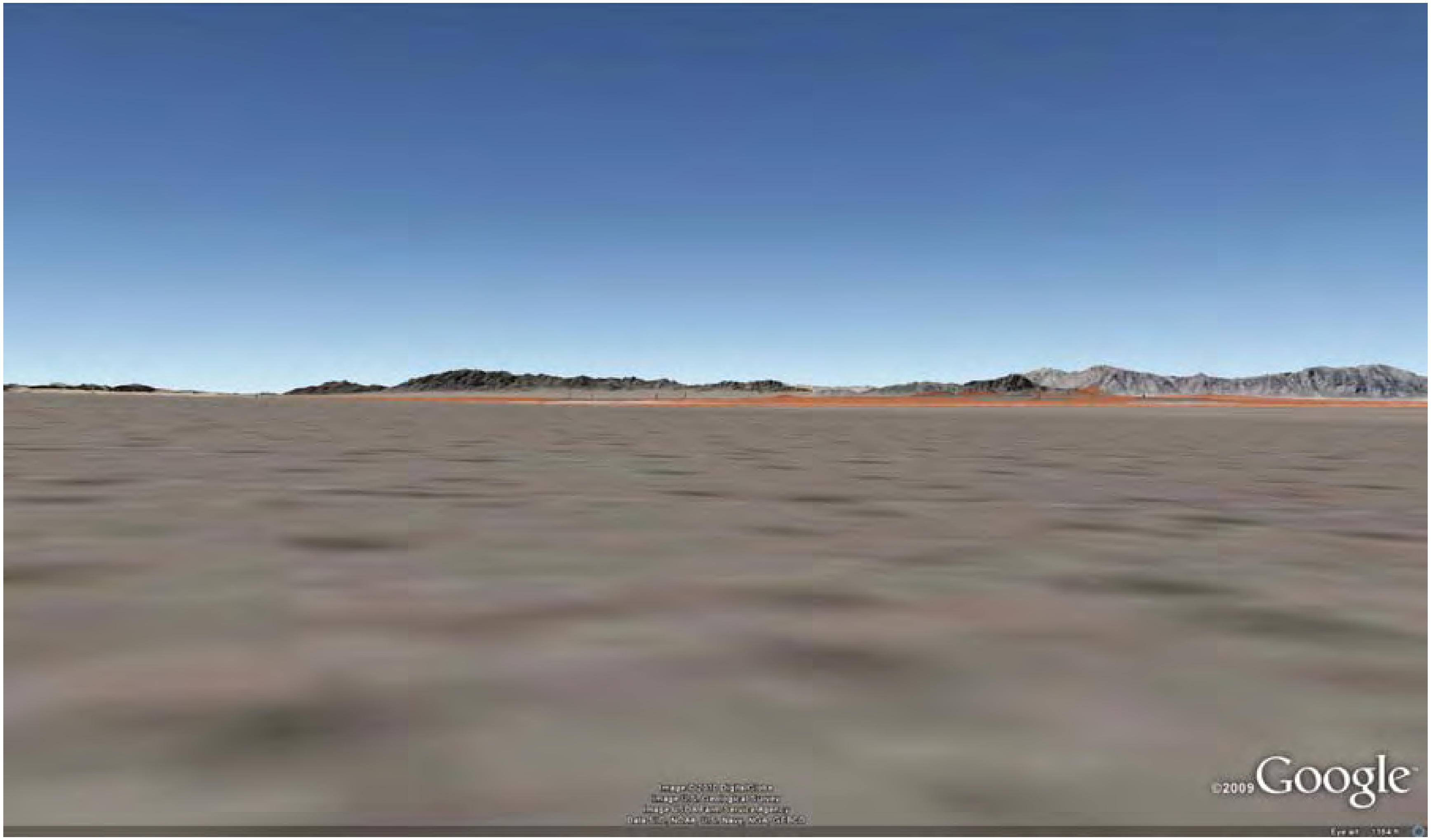

FIGURE 9.2.14.2-16 Google Earth Visualization of the Proposed Iron Mountain SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from the Ward Valley Floor in the Northern Portion of the Turtle Mountains WA

If power towers were present within the SEZ, when operating, the receivers would likely appear as distant points of light against the backdrop of the valley floor or the bajadas of the Palen-McCoy or Granite Mountains. At night, if sufficiently tall, the power towers could have red or white flashing hazard navigation lights that would likely be visible from this viewpoint and could be conspicuous, given the dark night skies in the vicinity of the SEZ. Other lighting associated with solar facilities in the SEZ could potentially be visible as well.

The potential visual contrast expected for this viewpoint would vary depending on the numbers, types, sizes, and locations of solar facilities in the SEZ, and on other project- and site-specific factors, but because the viewpoint is not elevated with respect to the SEZ and is 8 mi (13 km) from the nearest point in the SEZ, the SEZ would occupy a smaller portion of the field of view than from more elevated and/or closer viewpoints. Under the 80% development scenario analyzed in this PEIS, solar facilities within the SEZ would likely attract visual attention, but would be unlikely to dominate the view from this location, and would be expected to create moderate visual contrasts as viewed from this location within the WA.

In summary, the Turtle Mountains WA is adjacent to the SEZ, and many locations within the WA would have clear views of solar facilities in the SEZ across much of the field of view to the west of the WA. Visibility extends far eastward into the interior of the WA. Given that there could be numerous solar facilities within the SEZ, with a variety of technologies employed, and a range of supporting facilities that would contribute to visual impacts, such as transmission towers and lines, substations, power block components, and roads, the resulting visually complex landscape would be essentially industrial in appearance and would contrast greatly with the surrounding mostly natural-appearing landscape. Under the 80% development scenario analyzed in this PEIS, strong levels of visual contrast from solar facilities within the SEZ could be observed from many locations within the WA, especially from elevated viewpoints.

National Natural Landmark

- *Turtle Mountains*—The Turtle Mountains NNL is a 50,057-acre (202.57-km^2) NNL designated for outstanding scenic values, located almost entirely within the Turtle Mountains WA (see above). The Turtle Mountains NNL encompasses the same lands as the Turtle Mountain Scenic ACEC.

Visual impacts on the Turtle Mountains NNL associated with utility-scale solar energy development in the proposed Iron Mountain SEZ would be similar to those described for the mountainous portions of the Turtle Mountains WA (see above). The two-mountain viewpoint Google Earth visualizations described under the WA impact analysis are from viewpoints within both the NNL and the WA.

ACEC Designated for Outstandingly Remarkable Scenic Values

- *Turtle Mountains*—The Turtle Mountains ACEC is a 50,057-acre (202.57-km^2) ACEC designated by the BLM for its outstanding scenic values, located almost entirely within the Turtle Mountains WA (see above). The ACEC is adjacent to the SEZ at its southern-most point. The ACEC encompasses much of the Turtle Mountains but, unlike the WA, does not extend into the Ward Valley floor. Many locations within the ACEC provide panoramic views of the Ward Valley and the SEZ.

  Solar energy facilities within the SEZ could be visible from the front slopes of the Turtle Mountains in the southwestern portion of the ACEC (approximately 10,024 acres [40.566 km^2] in the 650-ft [198.1-m] viewshed, or 20.0% of the total ACEC acreage, and 8,639 acres [34.96 km^2] in the 24.6-ft [7.5-m] viewshed, or 17.3% of the total ACEC acreage). The main visible area of the ACEC extends approximately 4.4 mi (7.1 km) from the northeast corner of the SEZ, with a separate small area of visibility out to approximately 6.2 mi (10 km).

  Visual impacts on the Turtle Mountains ACEC associated with utility-scale solar energy development in the proposed Iron Mountain SEZ would be similar to those described for the mountainous portions of the Turtle Mountains WA (see above). The two-mountain viewpoint Google Earth visualizations described under the WA impact analysis are from viewpoints within both the ACEC and the WA.

Additional scenic resources exist at the national, state, and local levels, and impacts on both federal and nonfederal lands may occur, including sensitive traditional cultural properties important to Tribes. Note that in addition to the resource types and specific resources analyzed in this PEIS, future site-specific NEPA analyses would include state and local parks, recreation areas, other sensitive visual resources, and communities close enough to the proposed project to be affected by visual impacts. Selected other lands and resources are included in the discussion below.

In addition to impacts associated with the solar energy facilities themselves, sensitive visual resources could be affected by facilities that would be built and operated in conjunction with the solar facilities. With respect to visual impacts, the most important associated facilities would be access roads and transmission lines, the precise location of which cannot be determined until a specific solar energy project is proposed. For this analysis, the impacts of construction and operation of transmission lines outside of the SEZ were not assessed, assuming that the existing 230-kV transmission line might be used to connect some new solar facilities to load centers, and that additional project-specific analysis would be done for new transmission construction or line upgrades. However, transmission lines to connect facilities to the existing line would be required. Note that depending on project- and site-specific conditions, visual impacts associated with access roads, and particularly transmission lines, could be large. Detailed information about visual impacts associated with transmission lines is presented in Section 5.7.1. A detailed site-specific NEPA analysis would be required to precisely determine visibility and associated impacts for any future solar projects, based on more precise knowledge of facility location and characteristics.

Impacts on Selected Other Lands and Resources

State Route 62 and Cadiz Road. State Route 62, a two-lane highway, passes through the southern edge of the Iron Mountain SEZ. The AADT value for State Route 62 at Cadiz Road is 2,000 vehicles (Caltrans 2009), although traffic would increase slightly as a result of solar energy development within the SEZ. Cadiz Road is currently an unpaved road that roughly bisects the SEZ. Under the PEIS development scenario, travelers on both roadways could be subject to large visual impacts from solar energy development within the SEZ.

Solar facilities within the SEZ would be in full view from both roads, and facilities located near the roads would strongly attract the eye and likely dominate views from the roads. Views of the Ward Valley and surrounding mountains could be completely or partially screened by solar facilities, depending on the layout of solar facilities within the SEZ. Because the roads pass through the SEZ, strong visual contrasts could result, depending on solar project characteristics and location within the SEZ. If solar facilities were located on both sides of the roads, the banks of solar collectors on both sides of the roads could form a visual “tunnel” that travelers would pass through.

If power tower facilities were located in the SEZ in close proximity to the roads, the receivers could appear as brilliant light sources as viewed from the roads and, if sufficiently close to the roads, would likely strongly attract views. They could be a distraction to travelers. Also, during certain times of the day from certain angles, sunlight on dust particles in the air might result in the appearance of light streaming down from the tower.

At night, if sufficiently tall, the power towers could have red or white flashing hazard navigation lights, and if the towers were close to the roads, they would be very conspicuous, given the dark night skies in the vicinity of the SEZ. Other lighting associated with solar facilities in the SEZ would likely be visible as well.

Other impacts. In addition to the impacts described for the resource areas above, nearby residents and visitors to the area may experience visual impacts from solar energy facilities located within the SEZ (as well as any associated access roads and transmission lines) from their residences, or as they travel area roads. The range of impacts experienced would be highly dependent on viewer location, and on project types, locations, sizes, and layouts, as well as the presence of screening. However, under the 80% development scenario analyzed in the PEIS, from some locations, strong visual contrasts from solar development within the SEZ could potentially be observed.

9.2.14.2.3 Summary of Visual Resource Impacts for the Proposed Iron Mountain SEZ

Under the 80% development scenario analyzed in this PEIS, there could be multiple solar facilities within the Iron Mountain SEZ, a variety of technologies employed, and a range of supporting facilities that would contribute to visual impacts, such as transmission towers and lines, substations, power block components, and roads. The resulting visually complex landscape would be essentially industrial in appearance and would contrast strongly with the surrounding mostly natural-appearing landscape. Large visual impacts on the SEZ and surrounding lands within the SEZ viewshed would be associated with solar energy development within the SEZ because of major modification of the character of the existing landscape. Additional impacts could occur from construction and operation of transmission lines and access roads within and/or outside the SEZ.

The SEZ is in an area of low scenic quality. Visitors to the area, workers, and residents of nearby areas may experience visual impacts from solar energy facilities located within the SEZ (as well as any associated access roads and transmission lines) as they travel area roads.

Utility-scale solar energy development within the proposed Iron Mountain SEZ is likely to result in strong visual contrasts for some viewpoints in: the Palen-McCoy Wilderness, located 1.6 mi (2.6 km) south of the SEZ; the Old Woman Mountains WA, adjacent to the SEZ; and the Turtle Mountains WA, the Turtle Mountains Scenic ACEC, and the Turtle Mountains NNL, also adjacent to the SEZ.

Portions of State Route 62 and Cadiz Road intersect the SEZ. Travelers on these roads would be likely to observe strong visual contrasts from solar energy development within the SEZ.

Moderate visual contrast levels would be expected for high-elevation viewpoints in Joshua Tree National Park and WA, approximately 9.9 mi (15.9 km) southwest of the SEZ, and in the Rice Valley WA, approximately 6.6 mi (10.6 km) southeast of the SEZ.

Minimal to weak visual contrasts would be expected for some viewpoints within other sensitive visual resource areas within the SEZ 25-mi (40 km) viewshed.

9.2.14.3 SEZ-Specific Design Features and Design Feature Effectiveness

The presence and operation of large-scale solar energy facilities and equipment would introduce major visual changes into non-industrialized landscapes and could create strong visual contrasts in line, form, color, and texture that could not easily be mitigated substantially. However, the implementation of required programmatic design features presented in Appendix A, Section A.2.2, would reduce the magnitude of visual impacts experienced. While the applicability and appropriateness of some design features would depend on site- and project-specific information that would be available only after a specific solar energy project had been proposed, some SEZ-specific design features can be identified for the Iron Mountain SEZ at this time, as follows:

- Within the SEZ, in areas visible from and within 1 mi (1.6 km) of the boundary of the Old Woman Mountains WA, visual impacts associated with solar energy project operation should be consistent with VRM Class II management objectives (see Table 9.2.14.3.-1), as experienced from key observation points (KOPs) (to be determined by the BLM) within the WA (see Table 9.2.14.3-1). In areas visible from between 1 and 3 mi (1.6 and 4.8 km), visual impacts should be consistent with VRM Class III management objectives. The VRM Class II impact-level-consistency mitigation would affect approximately 2,101 acres (8.502 km^2) within the western portion of the SEZ. The VRM Class III impact-level-consistency mitigation would affect approximately 9,311 additional acres (37.68 km^2).

- Within the SEZ, in areas visible from and south of State Route 62, visual impacts associated with solar energy project operation should be consistent with VRM Class III management objectives, as experienced from KOPs (to be

TABLE 9.2.14.3-1 VRM Management Class Objectives

VRM Management Class Objectives	
Class I Objective	The objective of this class is to preserve the existing character of the landscape. This class provides for natural ecological changes; however, it does not preclude very limited management activity. The level of change to the characteristic landscape should be very low and must not attract attention.
Class II Objective	The objective of this class is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.
Class III Objective	The objective of this class is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.
Class IV Objective	The objective of this class is to provide for management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements.

Source: BLM 1986b.

determined by the BLM) within the Palen-McCoy WA. The VRM Class III impact-level-consistency mitigation would affect approximately 5,725 additional acres (23.168 km^2).

- Within the SEZ, in areas visible from and within 3 mi (4.8 km) of the boundary of the Turtle Mountains WA, visual impacts associated with solar energy project operation should be consistent with VRM Class II management objectives, as experienced from KOPs (to be determined by the BLM) within the WA. In areas visible from between 3 and 5 mi (4.8 and 8 km), visual impacts should be consistent with VRM Class III management objectives. The VRM Class II impact-level-consistency mitigation would affect approximately 21,219 acres (85.871 km^2) within the western portion of the SEZ. The VRM Class III impact-level-consistency mitigation would affect approximately 13,301 additional acres (53.827 km^2).

Because of the overlap in areas affected by the design features specified above, the total acreage affected by the design features is approximately 50,984 acres (206.326 km^2), or 47.9% of the total SEZ acreage. The acreage affected by VRM Class II impact-level consistency is 23,320 acres (94.373 km^2), or 21.9% of the total SEZ acreage. The acreage affected by VRM Class III impact-level consistency is 27,664 acres (111.953 km^2), or 26% of the total SEZ acreage. The areas subject to SEZ-specific design features requiring consistency with VRM Class II and Class III management objectives are shown in Figure 9.2.14.2-17.

Application of the SEZ-specific design features above would substantially reduce visual impacts associated with solar energy development within the SEZ.

Application of the SEZ-specific design feature to restrict allowable visual impacts associated with solar energy project operations to within 3 mi (4.8 km) of the Old Woman Mountains WA would substantially reduce potential visual impacts on the WA by limiting impacts within the BLM-defined foreground of the viewshed of this area, where potential visual impacts would be greatest.

Application of the SEZ-specific design feature to restrict allowable visual impacts associated with solar energy project operations to south of State Route 62 would substantially reduce potential visual impacts on the Palen-McCoy WA by limiting impacts within the BLM-defined foreground of the viewshed of this area, where potential visual impacts would be greatest. This design feature would also reduce impacts on the Turtle Mountains WA, Scenic ACEC, and NNL, as well as on travelers on State Route 62.

Application of the distance-based mitigation to restrict allowable visual impacts associated with solar energy project operations to within 5 mi (8 km) of the Turtle Mountains WA, Scenic ACEC, and NNL would substantially reduce potential visual impacts on these nationally recognized scenic resource areas by limiting impacts within the BLM-defined foreground–middleground distance within the viewshed of these areas, where potential visual impacts would be greatest. This SEZ-specific design feature would also reduce impacts on the Palen-McCoy Mountains WA, Scenic ACEC, and NNL and on travelers on State Route 62 and Cadiz Road.

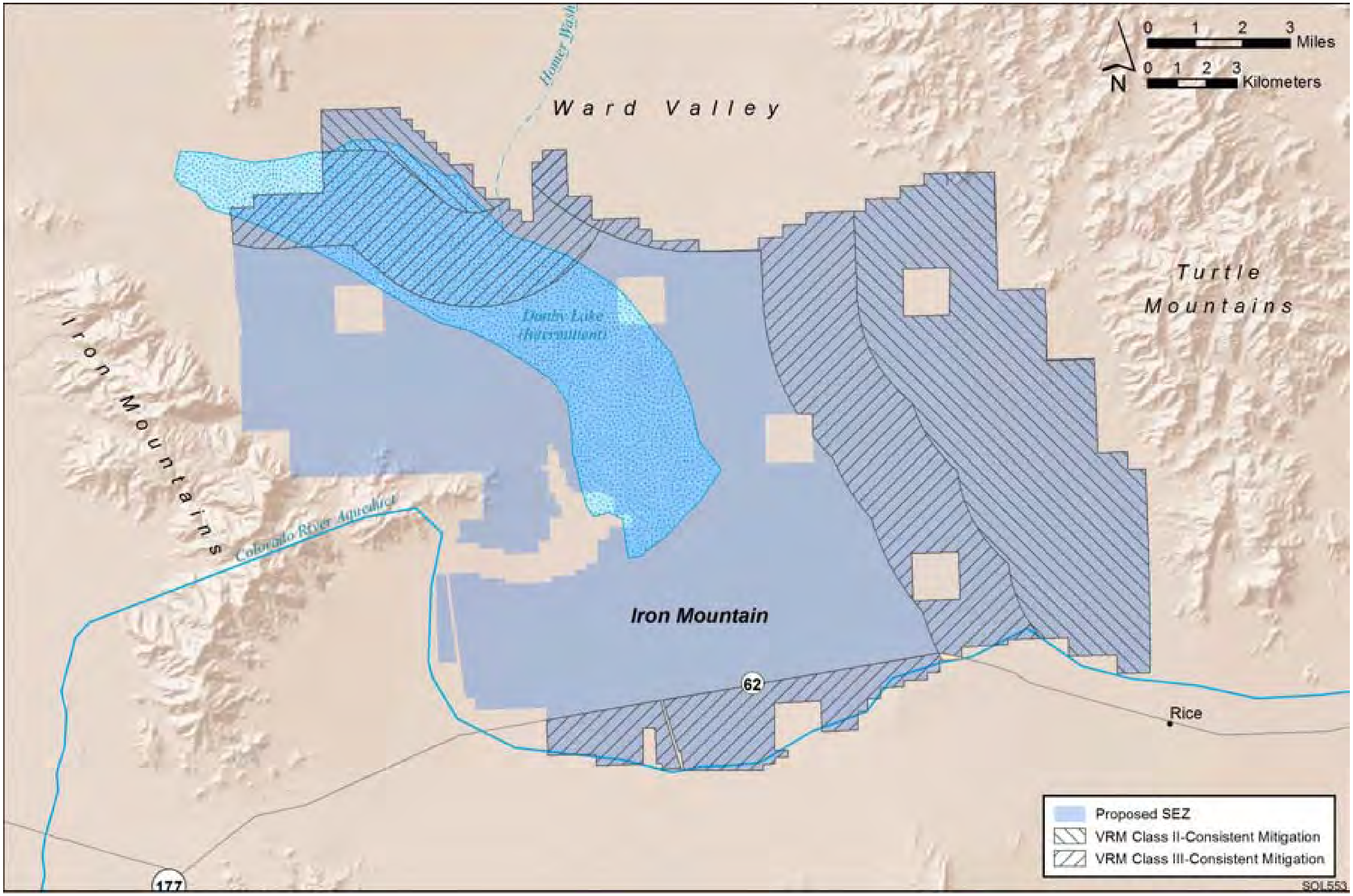

FIGURE 9.2.14.2-17 Areas within the Proposed Iron Mountain SEZ Affected by SEZ-Specific Distance-Based Visual Impact Design Features

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9.2.15 Acoustic Environment

9.2.15.1 Affected Environment

The proposed Iron Mountain SEZ is located mostly in the southeastern portion of San Bernardino County with a small, southern portion in Riverside County, in southeastern California. The County of San Bernardino has established noise standards for stationary sources, mobile sources, and all other structures (County of San Bernardino 2009). Noise standards applicable to solar energy development are those for stationary sources based on affected land use and time of day: 55 dBA daytime L_{eq} and 45 dBA nighttime L_{eq} for residential land use. Combining these two levels is the same as the EPA guideline of 55 dBA as L_{dn} for residential areas. In San Bernardino County, temporary construction activities between 7 a.m. and 7 p.m., except Sundays and federal holidays, are exempted from the noise regulations.

U.S. 95 lies as close as about 13 mi (21 km) east of the proposed SEZ, while State Route 62 passes through the southern portion of the proposed SEZ. Unpaved Cadiz Road runs southeast–northwest across the SEZ. A railroad runs through the SEZ along the Cadiz Road but is unused or rarely used. The nearest airport is Iron Mountain Pumping Plant Airport, located within the southwestern portion of the SEZ. Several airports are within 25 mi (40 km) of the SEZ: Aha-Quin Airport to the southeast, Desert Center Airport to the south–southwest, Cadiz Airstrip to the northwest, and Danby Airstrip to the north-northwest. An industrial area with trailers (East Milligan) in the northwestern portion of the SEZ, about 1 mi (1.6 km) east of Milligan, is currently used by sodium lease operators. There is no evidence of livestock grazing on-site. Therefore, noise sources around the SEZ include road traffic, infrequent railroad traffic, aircraft flyover, industrial activities including sodium mining and pumping activities, and activities and events at nearby IMPS residences. No sensitive receptors (e.g., hospitals, schools, or nursing homes) exist around the Iron Mountain SEZ. The IMPS and a cluster of its employee residences are located about 0.5 mi (0.8 km) west of the west–central portion of the SEZ. No population center with schools is located within a 20-mi (32-km) radius from the proposed Iron Mountain SEZ. The proposed Iron Mountain SEZ is mostly undeveloped, the overall character of which is considered rural to wilderness. To date, no environmental noise survey has been conducted around the Iron Mountain SEZ. On the basis of the population density in San Bernardino County, the day-night average sound level (L_{dn} or DNL) is estimated to be 41 dBA for San Bernardino County, typical of a rural area[8] (Eldred 1982; Miller 2002).

9.2.15.2 Impacts

Potential noise impacts associated with solar projects in the Iron Mountain SEZ would occur during all phases of the projects. During the construction phase, potential noise impacts associated with operation of heavy equipment and vehicular traffic on nearby residences

8 Rural and undeveloped areas have sound levels in the range of 33 to 47 dBA as DNL (Eldred 1982). Typically, the nighttime level is 10 dBA lower than the daytime level, and it can be interpreted as 33 to 47 dBA (mean 40 dBA) during daytime hours and 23 to 37 dBA (mean 30 dBA) during nighttime hours.

(within 0.5 mi [0.8 km]) would be anticipated, albeit of short duration. During the operations phase, potential impacts on nearby residences would be anticipated, depending on the solar technologies employed. Noise impacts shared by all solar technologies are discussed in detail in Section 5.13.1, and technology-specific impacts are presented in Section 5.13.2. Impacts specific to the Iron Mountain SEZ are presented in this section. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and the application of any additional SEZ-specific design features (see Section 9.2.15.3 below). This section primarily addresses potential noise impacts on humans, although potential impacts on wildlife at nearby sensitive areas are discussed, Additional discussion on potential noise impacts on wildlife is presented in Section 5.10.2.

9.2.15.2.1 Construction

The proposed Iron Mountain SEZ has a relatively flat terrain; thus, minimal site preparation activities would be required, and associated noise levels would be lower than those during general construction (e.g., erecting building structures and installing equipment, piping, and electrical). Solar array construction would also generate noise, but it would be spread over a wide area.

For the parabolic trough and power tower technologies, the highest construction noise levels would occur at the power block area; a maximum of 95 dBA at a distance of 50 ft (15 m) is assumed, if impact equipment such as pile drivers or rock drills is not being used. Typically, the power block area is located in the center of the solar facility, at a distance of more than 0.5 mi (0.8 km) to the facility boundary. However, noise levels from construction of the solar array would be lower than 95 dBA. When geometric spreading and ground effects are considered, as explained in Section 4.13.1, noise levels would attenuate to about 40 dBA at a distance of 1.2 mi (1.9 km) from the power block area. This noise level is typical of daytime mean rural background levels. In addition, mid- and high-frequency noise from construction activities is significantly attenuated by atmospheric absorption under the low-humidity conditions typical of an arid desert environment and by temperature lapse conditions typical of daytime hours; thus noise attenuation to background levels would occur at distances somewhat shorter than 1.2 mi (1.9 km). If a 10-hour daytime work schedule is considered, the EPA guideline level of 55 dBA L_{dn} for residential areas (EPA 1974) would occur at about 1,200 ft (370 m) from the power block area, which would be well within the facility boundary. For construction activities occurring near the residences closest to the west-central SEZ boundary, estimated noise levels at the nearest residences are about 50 dBA, which is higher than a typical daytime mean rural background level of 40 dBA but is below the San Bernardino County regulation of 55 dBA daytime L_{eq}. In addition, 47 dBA L_{dn}[9] at this location falls below the EPA guideline of 55 dBA for residential areas.

It is assumed that a maximum of three projects at any one time would be developed for SEZs larger than 30,000 acres (121.4 km^2) such as the Iron Mountain SEZ. If all three projects

[9] For this analysis, background levels of 40 and 30 dBA for daytime and nighttime hours, respectively, are assumed, which result in day-night average noise level (L_{dn}) of 40 dBA.

were to be built within the SEZ near the residences at the IMPS, that is, south, east, and north of the residences, noise levels would be about 3 dBA higher than the above-mentioned values. While this is an unlikely scenario, combined noise levels would be only a slightly noticeable increase of about 3 dB over a single project.

In addition, noise levels were estimated at the specially designated areas within 5 mi (8 km) of the Iron Mountain SEZ, which is the farthest distance that noise (except extremely loud noise) would be discernable. There are three specially designated areas within the range. Patton Iron Mountain Divisional Camp ACEC lies as close as 0.5 mi (0.8 km) southwest of the SEZ but this ASEC is not a noise-sensitive area (i.e., this area was designated as an ACEC because it contains cultural resources). Chemehuevi Desert Wildlife Management Area (DWMA) and Turtle Mountains Wilderness, where noise might be an issue, are adjacent to the SEZ. For construction activities occurring near these specially designated areas, noise levels are estimated to be about 74 dBA at the boundaries of these specially designated areas, higher than the typical daytime mean rural background level of 40 dBA. Thus, if construction would occur near the specially designated areas, portions of the specially designated areas close to the SEZ (within approximately 1 mi [1.6 km]) could be disturbed by construction noise from the SEZ. However, sound levels above 90 dB are likely to adversely affect wildlife (Manci et al. 1988). Thus construction noise is not likely to adversely affect wildlife except in areas directly adjacent to the construction site.

Depending on the soil conditions, pile driving might be required for installation of solar dish engines. However, the pile drivers used would be relatively small and quiet, such as vibratory or sonic drivers, rather than the impulsive impact pile drivers frequently seen at large-scale construction sites. Potential impacts on neighboring residences would be anticipated to be minor, considering the distance to the nearest residence (more than 0.5 mi [0.8 km] from the SEZ boundary).

It is assumed that most construction activities would occur during the day when noise is better tolerated, than at night, because of the masking effects of background noise. In addition, construction activities for a utility-scale facility are temporary in nature (typically a few years). Construction would cause some unavoidable but localized short-term impacts on neighboring communities, particularly for activities occurring near the west-central SEZ boundary, close to the nearest residences.

Construction activities could result in various degrees of ground vibration, depending on the equipment used and construction methods employed. All construction equipment causes ground vibration to some degree, but activities that typically generate the most severe vibrations are high-explosive detonations and impact pile driving. As for noise, vibration would diminish in strength with distance. For example, vibration levels at receptors beyond 140 ft (43 m) from a large bulldozer (87 VdB at 25 ft [7.6 m]) would diminish below the threshold of perception for humans, which is about 65 VdB (Hanson et al. 2006). During the construction phase, no major construction equipment that can cause ground vibration would be used, and no residences or sensitive structures are located in close proximity. Therefore, no adverse vibration impacts are anticipated from construction activities, including from pile driving for dish engines.

It is assumed that the existing 230-kV transmission line located within the SEZ might be used to connect new solar facilities to the regional grid and that additional project-specific analysis would be conducted for new transmission construction or line upgrades. However, some construction of transmission lines could occur within the SEZ. Potential noise impacts on nearby residences would be a minor component of construction impacts in comparison with solar facility construction and would be temporary in nature.

9.2.15.2.2 Operations

Noise sources common to all or most types of solar technologies include equipment motion from solar tracking; maintenance and repair activities (e.g., washing mirrors or replacing broken mirrors) at the solar array area; commuter/visitor/support/delivery traffic within and around the solar facility; and control/administrative buildings, warehouses, and other auxiliary buildings/structures. Diesel-fired emergency power generators and fire water pump engines would be additional sources of noise, but their operations would be limited to several hours per month (for preventive maintenance testing).

For the main solar energy technologies, noise-generating activities in the PV solar array area would be minimal, related mainly to solar tracking, if used. Dish engine technology, which employs collector and converter devices in a single unit, on the other hand, generally has the strongest noise sources.

For the parabolic trough and power tower technologies, most noise sources during operations would be in the power block area, including the turbine generator (typically in an enclosure), pumps, boilers, and dry or wet-cooling systems. The power block is typically located in the center of the facility. On the basis of a 250-MW parabolic trough facility with a cooling tower (Beacon Solar, LLC 2008), simple noise modeling indicates that noise levels would be more than 85 dBA around the power block, but about 51 dBA at the facility boundary, about 0.5 mi (0.8 km) from the power block area. For the Iron Mountain SEZ, the predicted noise level from the power block would be about 45 dBA at the nearest residences located 0.5 mi (0.8 km) from the facility boundary, which is higher than typical daytime mean rural background level of 40 dBA but well below the San Bernardino County regulation of 55 dBA daytime L_{eq}. If TES were not used (i.e., if the operation were limited to daytime, 12 hours only[10]), the EPA guideline level of 55 dBA (as L_{dn} for residential areas) would occur at about 1,370 ft (420 m) from the power block area and thus would not be exceeded outside of the proposed SEZ boundary. At the nearest residences, about 44 dBA as L_{dn} would be estimated, which is well below the EPA guideline level. As for construction, if three parabolic trough and/or power tower facilities were operating around the residences at the IMPS, combined noise levels would be only about 3 to 4 dBA above that for a single facility. However, day-night average noise levels higher than those estimated above by using the simple noise modeling would be anticipated if TES were used during nighttime hours, as explained below and in Section 4.13.1.

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[10] Maximum possible operating hours at the summer solstice, but limited to 7 to 8 hours at the winter solstice.

On a calm, clear night typical of the proposed Iron Mountain SEZ setting, the air temperature would likely increase with height (temperature inversion) because of strong radiative cooling. Such a temperature profile tends to focus noise downward toward the ground. There would be little, if any, shadow zone[11] within 1 or 2 mi (2 or 3 km) of the noise source in the presence of a strong temperature inversion (Beranek 1988). In particular, such conditions add to the effect of noise being more discernable during nighttime hours, when the background levels are the lowest. To estimate day-night average noise level (L_{dn}), 6-hour nighttime generation with TES is assumed after 12-hour daytime generation. For nighttime hours under temperature inversion, 10 dB is added to noise levels estimated from the uniform atmosphere (see Section 4.13.1). On the basis of these assumptions, the estimated nighttime noise level at the nearest residence (about 1 mi [1.6 km]) from the power block area for a solar facility located near the west-central SEZ boundary) would be 55 dBA, which is higher than San Bernardino County regulation of 45 dBA nighttime L_{eq}. The combined day/night noise is estimated to be about 57 dBA as L_{dn}, which is a little higher than the EPA guideline of 55 dBA for residential areas. The assumptions are conservative in terms of operating hours, and no credit was given to other attenuation mechanisms, so it is likely that noise levels would be lower than 57 dBA at the nearest IMPS residences, even if TES were used at a solar facility. If three parabolic trough and/or power tower facilities were operating around the residences at the IMPS, combined noise levels would be about 3 dBA above that for a single facility. Consequently, operating parabolic trough or power tower facilities using TES and located near the west-central SEZ boundary could result in noise levels above background levels, San Bernardino regulation levels, and EPA guidance levels, and corresponding adverse noise impacts on the nearest residences.

For a single solar facility located near the Chemehuevi DWMA or Turtle Mountains Wilderness, estimated daytime noise level at the boundaries of these areas would be about 51 dBA. Thus, areas near the boundary of these specially designated areas (say, within 1 mi [1.6 km]) could be disturbed by the operational noise from the SEZ, but this noise is not anticipated to adversely affect wildlife (Manci et al. 1988).

In the permitting process, refined noise propagation modeling would be warranted along with measurement of background noise levels.

The solar dish engine is unique among CSP technologies, because it generates electricity directly and does not require a power block. A single, large, solar dish engine has relatively low noise levels, but a solar facility might employ tens of thousands of dish engines, which would cause high noise levels around such a facility. For example, the proposed 750-MW SES Solar Two dish engine facility in California would employ as many as 30,000 dish engines (SES Solar Two, LLC 2008). At the Iron Mountain SEZ, on the basis of the assumption of a dish engine facility of up to 9,469 MW covering 80% of the total area (85,217 acres [344.9 km^2]), up to 378,740 25-kW dish engines could be employed. Also, for a large dish engine facility, several thousand step-up transformers would be embedded in the dish engine solar field, along with several substations; however, the noise from these sources would be masked by dish engine noise.

[11] A shadow zone is defined as the region in which direct sound does not penetrate because of upward diffraction.

The composite noise level of a single dish engine would be about 89 dBA at a distance of 3 ft (0.9 m) (SES Solar Two, LLC 2008). This noise level would be attenuated to about 40 dBA (typical of the mean rural daytime environment) within 340 ft (105 m). However, the combined noise level from tens of thousands of dish engines operating simultaneously would be high in the immediate vicinity of the facility, for example, about 53 dBA at 1.0 mi (1.6 km) and 51 dBA at 2 mi (3 km) from the boundary of the square-shaped dish engine solar field, both of which are higher than typical daytime background levels of 40 dBA in rural areas but lower than the San Bernardino County regulation of 55 dBA daytime L_{eq}. These levels would occur at somewhat shorter distances, considering noise attenuation by atmospheric absorption and temperature lapse during daytime hours. To estimate noise levels at the nearest residences, it was assumed that dish engines were placed all over the Iron Mountain SEZ at intervals of 98 ft (30 m). Under these assumptions, the estimated noise levels at the nearest receptor (0.5 mi [0.8 km] from the SEZ boundary) would be about 54 dBA, which is slightly lower than the San Bernardino County regulation of 55 dBA daytime L_{eq}. On the basis of 12-hour daytime operation, the estimated 51 dBA L_{dn} at these residences is below the EPA guideline of 55 dBA L_{dn} for residential areas. Noise from dish engines could cause adverse impacts on the nearest residences, depending on background noise levels and meteorological conditions. Thus, consideration of minimizing noise impacts is very important during the siting of dish engine facilities. Direct mitigation of dish engine noise through noise control engineering could also be considered.

For dish engines placed all over the SEZ, estimated noise levels would be about 59 and 61 dBA at the boundaries of the Chemehuevi DWMA or Turtle Mountains Wilderness, respectively. These levels are higher than the typical daytime mean background level of 40 dBA. However, dish engine noise from the SEZ would not be likely to adversely affect wildlife at nearby specially designated areas (Manci et al. 1988).

During operations, no major ground-vibrating equipment would be used. In addition, no sensitive structures are located close enough to the Iron Mountain SEZ to experience physical damage. Therefore, potential vibration impacts on surrounding communities and vibration-sensitive structures during operation of any solar facility would be minimal.

Transformer-generated humming noise and switchyard impulsive noises would be generated during the operation of solar facilities. These noise sources would be located near the power block area, typically near the center of a solar facility. Noise from these sources would generally be limited within the facility boundary and rarely be heard at nearby residences, assuming a 1-mi (1.6-km) distance (at least 0.5 mi [0.8 km] to the facility boundary and another 0.5 mi [0.8 km] to the nearest residences). Accordingly, potential impacts of these noise sources on the nearest residences would be minimal.

For this analysis, the impacts of construction and operation of transmission lines outside of the SEZ were not assessed, assuming that the existing 230-kV transmission line might be used to connect some new solar facilities to load centers, and that additional project-specific analysis would be done for new transmission construction or line upgrades. However, some construction of transmission lines within the SEZ could occur. For impacts from transmission line corona discharge noise during rainfall events (discussed in Section 5.13.1.5), the noise level at 50 ft (15 m) and 300 ft (91 m) from the center of a 230-kV transmission line towers would be about

39 and 31 dBA (Lee et al. 1996), respectively, typical of daytime and nighttime mean background levels in rural environments. Corona noise includes high-frequency components, considered to be more annoying than low-frequency environmental noise. However, corona noise would not likely cause impacts, unless a residence was located close to it (e.g., within 500 ft [152 m] of a 230-kV transmission line). The Iron Mountain SEZ is located in an arid desert environment, and incidents of corona discharge are infrequent. Therefore, potential impacts on nearby residences from corona noise along the transmission line ROW would be negligible.

9.2.15.2.3 Decommissioning/Reclamation

Decommissioning/reclamation requires many of the same procedures and equipment used in traditional construction. Decommissioning/reclamation would include dismantling of solar facilities and support facilities such as buildings/structures and mechanical/electrical installations; disposal of debris; grading; and revegetation as needed. Activities for decommissioning would be similar to those used for construction but on a more limited scale. Potential noise impacts on surrounding communities would be correspondingly lower than those for construction activities. Decommissioning activities would be of short duration, and their potential impacts would be minor and temporary in nature. The same design features adopted during the construction phase could also be implemented during the decommissioning phase.

Similarly, potential vibration impacts on surrounding communities and vibration-sensitive structures during decommissioning of any solar facility would be lower than those during construction and thus minimal.

9.2.15.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A, Section A.2.2, would greatly reduce or eliminate the potential for noise impacts from development and operation of solar energy facilities. While some SEZ-specific design features are best established when project details are being considered, measures that can be identified at this time include the following:

- Noise levels from cooling systems equipped with TES should be managed so that levels at the nearest residences to the west of the west-central SEZ are kept within applicable guidelines. This could be accomplished in several ways, for example, through placing the power block approximately 1 to 2 mi (1.6 to 3 km) or more from residences, limiting operations to a few hours after sunset, and/or installing fan silencers.

- Dish engine facilities within the Iron Mountain SEZ should be located more than 1 to 2 mi (1.6 to 3 km) from the nearest residences located to the west of the west-central SEZ (i.e., the facilities should be located in other portions of the proposed SEZ). Direct noise control measures applied to individual dish engine systems could also be used to reduce noise impacts at the nearest residences.

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9.2.16 Paleontological Resources

9.2.16.1 Affected Environment

The Iron Mountain SEZ is covered predominantly by Quaternary/Tertiary deposits of various types. The eastern half is mostly thick alluvial deposits (more than 100 ft thick), ranging in age from the Miocene to Holocene. The total acreage of the alluvial deposits within the SEZ is 60,421 acres (244 km^2), or 57% of the SEZ. The western half is composed mostly of eolian (dune sand) and playa sediments. The total acreage of eolian sediments within the SEZ is 27,744 acres (112 km^2), or 26% of the SEZ, and the total acreage of playa sediments is 17,469 acres (71 km^2), or 16% of the SEZ. Peripheral sections of the west-central portion and northeast corner of the SEZ are composed of igneous and metamorphic rocks. The total acreage of these volcanic deposits within the SEZ is 887 acres (3.6 km^2), or 1% of the SEZ. In the absence of a PFYC map for the California Desert District, a preliminary classification of PFYC Class 3b is assumed for the alluvial, eolian, and playa deposits. Class 3b indicates that the potential for the occurrence of significant fossil materials is unknown and needs to be investigated further (see Section 4.8 for a discussion of the PFYC system). The PFYC for the volcanic deposits is Class 1, indicating the occurrence of significant fossil materials is nonexistent or extremely rare. On the basis of a sensitivity map supplied by the field archaeologist in the Needles Field Office, areas adjacent to and partially within Danby Lake have been designated as having a high potential for containing paleontological material. Pleistocene paleontological resources including fossil bone and teeth from extinct horse and camel and fossil root casts have been found in remnant lake bed deposits from Danby Lake (Reynolds 1988). These areas include playa sediments, thick alluvial sediments, and eolian sediments (dune sand). This high sensitivity designation would change the preliminary classification mentioned above from a PFYC Class 3b to Class 4/5, and the area would require a paleontological survey. The sensitivity of the remaining areas of the Iron Mountain SEZ is identified as unknown on that map, consistent with a PFYC Class 3b designation.

9.2.16.2 Impacts

The potential for impacts on significant paleontological resources at the Iron Mountain SEZ in Ward Valley is unknown. A more detailed investigation of the local geological deposits of the SEZ and their potential depth is needed. Once a project area has been chosen, a paleontological survey may be needed based on consultation with BLM. The appropriate course of action would be determined as established in BLM IM2008-009 and IM2009-011 (BLM 2007a, 2008b). The area around Danby Lake within the Iron Mountain SEZ has a high potential to contain paleontological deposits and would require a paleontological survey. Section 5.14 discusses the types of impacts that could occur to any significant paleontological resources found to be present within the Iron Mountain SEZ. Impacts will be minimized through the implementation of programmatic design features described in Appendix A, Section A.2.2.

Indirect impacts on paleontological resources outside of the SEZ, such as through looting or vandalism, are unknown but unlikely because any such resources would be below the surface and not readily accessed. Programmatic design features for controlling water runoff and sedimentation would prevent erosion-related impacts on buried deposits outside of the SEZ.

No new roads or transmission lines have been assessed for the proposed Iron Mountain SEZ, assuming existing corridors would be used; impacts on paleontological resources related to the creation of new corridors would be evaluated at the project-specific level if new road or transmission construction or line upgrades are to occur.

A programmatic design feature requiring a stop work order in the event of an inadvertent discovery of paleontological resources would reduce impacts by preserving some information and allowing possible excavation of the resource, if warranted. Depending on the significance of the find, some modification to the project footprint could also result. Since the SEZ is located in an area preliminarily classified as PFYC Class 3b or greater and fossils have been found in deposits associated with Danby Lake, a stipulation would be included in permitting documents to alert solar energy developers to the possibility of a delay if paleontological resources were uncovered during surface-disturbing activities.

9.2.16.3 SEZ-Specific Design Features and Design Feature Effectiveness

Impacts would be minimized through the implementation of required programmatic design features, including a stop-work stipulation in the event that paleontological resources are encountered during construction, as described in Appendix A, Section A.2.2.

The need for and nature of any SEZ-specific design features would depend on findings of paleontological surveys.

9.2.17 Cultural Resources

Although arid and at first glance forbidding, the deserts of southeastern California are rich in cultural resources. The environment provides the conditions necessary for the creation of dramatic resources, such as the desert pavement necessary for the creation of giant geoglyphs or intaglios. Soil and climate combine to preserve the traces of an elaborate prehistoric system of trails and tread imprints of WWII armored vehicles. The desert landscape includes not only the traces of use and occupation by historic and prehistoric peoples, but natural features, including mountains, caves, and hot springs sacred to the region's Native American inhabitants.

9.2.17.1 Affected Environment

9.2.17.1.1 Prehistory

The proposed Iron Mountain SEZ is located in a transitional area between the Colorado Desert to the south and the Mojave Desert to the north. The earliest human use of the Colorado and Mojave Deserts is during the Paleoindian Period sometime between 12,000 and 10,000 B.P. Known sites from the region are predominantly located near inland lakes (now mostly dry, like Danby Lake) and on desert terraces and suggest that subsistence during this time period was focused on large game animals. The hunting-based period ended approximately 7,000 to 8,000 years ago when large game became scarce and ancient pluvial lakes started shrinking. The earliest sites are characterized by Clovis complex fluted points, and later sites (Lake Mojave complex and San Dieguito complex for the Mojave and Colorado Deserts, respectively) contain scrapers, blades, distinctive crescents, and projectile points (Jones and Klar 2007).

The Archaic Period is from approximately 8,000 B.P. to 1500 B.P. The Pinto complex is the primary cultural complex in the Mojave Desert during this time. Very little is known from this period in the Colorado Desert; thus it has become the source of important regional research questions. Archaic Period sites are generally identified through associated material culture, such as distinctive projectile point types and the presence of ground stone tools for processing plant resources. A Gypsum complex has also been identified in the Mojave Desert on the basis of projectile point types for the later portion of this period starting 3,000 to 4,000 years ago, but it does not appear to be present in the southern and eastern reaches of the desert (Jones and Klar 2007). As with earlier sites, Archaic Period sites in valley bottoms that would be suitable for solar energy development would be located near water sources. For example, a Pinto complex site has been recorded along the edge of Danby Lake within the Iron Mountain SEZ (see Section 9.2.17.1.5).

The Late Prehistoric/Protohistoric Period begins about 1,500 years ago and extends into the beginning of Euro-American exploration and colonization of the area. The archaeological Patayan complex is thought to be ancestral to the later Yuman cultural groups discussed in Section 9.2.17.1.2. The archaeological record includes paddle-and-anvil pottery, bow-and-arrow technology, subsistence agriculture along the Colorado and other rivers, rock art and intaglios. It is also a time of expanding trail networks. The following section on ethnohistory describes the cultural history of this time period in greater detail.

9.2.17.1.2 Ethnohistory

Although of diverse linguistic stock, the Native Americans that inhabited the southeastern California deserts when Euro-Americans first arrived lived in similar environments and shared similar lifeways and broadly similar beliefs, norms, and values (Halmo 2003). The mountains, valleys, and lakes provided seasonally available resources that Native American groups exploited in a seasonal round, moving from resource to resource in a regular pattern in lineage-based bands varying in size depending on the abundance of the resource. A pattern of seasonal camps combined with permanent villages emerged. Lineages tended to consider as their own, specific highly productive areas, such as dense stands of mesquite, while the areas between were shared not only with other lineages, but with other Tribes (Lightfoot and Parish 2009). Even when they grew wild, plant resources were often managed; stands of plant resources might be pruned, watered, or burned to encourage growth. The pattern of seasonal migration to exploit particular resources allowed the groups to adapt to changes in their subsistence base with the arrival of new cultural impulses and populations. Floodplain horticulture, adopted from the Southwest, allowed for the establishment of permanent, often multiethnic villages near the Colorado River (Halmo 2003). These became part of the migratory pattern that continued to take some ethnic groups into the highlands to harvest resources available there. Similarly, with the discovery of gold in the nineteenth century and the influx of Euro-American populations in the twentieth century, Native Americans added wage labor in mines and on large irrigated farms to their seasonal rounds (Bean et al. 1978).

The various Native American ethnic groups that inhabited the southeastern California deserts each had an area that they considered their homeland, but the boundaries between these areas were not sharply drawn. Travel to hunt, trade, or just visit neighboring groups was common (Kelly and Fowler 1986). The territorial claims of the different ethnic groups who occupied the Mojave and Colorado Deserts overlap each other. The boundaries between ethnic groups appear to have changed from one time period to another, and groups would sometimes share territory, or a group would invite its neighbors to share an abundant resource (CSRI 2002). In addition, different ethnic groups shared a considerable amount of ritual and world view, including an important religious song cycle sung by all groups in the language of the Mohave. This song cycle was associated with a network of trails, including the Salt Song Trail. This trail is both a physical and a spiritual path, connecting sacred natural features thought to be imbued with power and followed particularly as part of a mortuary ritual to aid the departed in their journey to the afterlife. Points along the trail are often marked with cairns, sometimes covering burials, cleared sleeping circles, panels of petroglyphs, and in some areas geoglyphs and intaglios. Stopping points along the trails are most often associated with springs (CSRI 1987). As discussed below in Section 9.2.18.1 the Native Americans living in southeastern California tend to view the landscape they inhabit holistically, each part intrinsically and inextricably connected to the whole. In some sense, the network of trails tied the landscape together.

The proposed Iron Mountain SEZ lies primarily within the traditional range of the Chemehuevi, a Numic speaking group often considered the southernmost group of the Southern Paiute. Ward Valley was used seasonally by the Mohave Tribe who were Yuman speakers, and before the early nineteenth century, by the Halchidhoma. In addition, the ranges of two Takic-speaking populations, the Cahuilla and the Serrano, closely approach the SEZ on the west. Given the frequent interaction between neighboring groups and the flexibility of the boundaries between them, all four are discussed here.

Chemehuevi

The Chemehuevi, a southern Paiute group, occupied the Parker and Blythe Valleys along the Colorado River at the invitation of the Mohave with whom they were allied, sometime between 1825 and 1830, after the Mohave and Quechan had driven out the Halchidhoma. In the late 1860s, hostilities erupted between the Mohave and Chemehuevi, and part of the Chemehuevi moved west to join Cahuilla and Serrano villages near Twentynine Palms. In 1874, the Office of Indian Affairs set aside part of the Mohave Reservation along the Colorado River for the Chemehuevi, but many did not want to return. In 1907, a separate reservation was established north of Parker, Arizona (Kelly and Fowler 1986).

The Chemehuevi occupied the eastern half of the Mojave Desert from south of Death Valley to Riverside and Imperial Counties. They may be divided into two groups—those that live along the Colorado River and adopted floodplain agriculture, and the Desert Chemehuevi (*Tiiranniwiwi*) who occupy the Chemehuevi Valley away from the river and retained their ties to the surrounding upland mountains and valleys (Farmer et al. 2009). However, even those living along the river retained more reliance on hunting and gathering than their neighbors. The Tiiranniwiwi are more likely to have been periodically present in the Iron Mountain SEZ, perhaps to hunt bighorn sheep, but the river dwellers may have hunted there as well (Farmer et al. 2009). Taken together, they had a diverse subsistence base, including irrigated mixed horticulture, wild plant management, and hunting. Normally they produced a surplus that they were able to trade (Halmo 2003).

Chemehuevi settlements were scattered, and band size varied with the season and available water, plant, and animal resources. Dwellings varied from pole structures covered with brush, to rock shelters, to earth-covered huts often with open fronts, adopted from the Mohave. Other items of Mohave material culture were likewise adopted, including ceramic styles, square metates (grinding stones), storage platforms, and personal adornment (Farmer et al. 2009).

The Chemehuevi maintained a trading relationship with the Cahuilla, and groups of Chemehuevi would travel as far west as the coast to trade for shells and as far east as the Hopi mesas. They were involved in a trade network that stretched from the Channel Islands to the Gila River Valley and the Great Plains, with the potential to bring material culture from some distance away to the Chemehuevi homeland.

Mohave

The Mohave appear to have entered the Mohave Valley some time around A.D. 1150. They resided chiefly along the eastern bank of the Colorado River but travelled widely, both for trade and to harvest seasonally available resources. They lived in sprawling settlements, rather than villages, with houses situated on low hills above the floodplain. They did not engage in irrigation agriculture but relied on seasonal inundation to water and refresh their fields. Unlike most other Colorado Desert Tribes, families owned individual fields and individual mesquite trees (Stewart 1983). Most of the year the Mohave lived on terraces above the Colorado River, moving to the floodplain in the spring to plant crops after seasonal floods receded (Kroeber 1925).

More than most other California Tribes, the Mohave have traditionally thought of themselves as a nation inhabiting a territory under a hereditary great chief of the Malika clan. Divided into patrilineal clans, they came together for warfare and other purposes. War leaders and shamans had great influence, and power was gained by dreaming, often in sacred locations. Their territorial claims are extensive, reflecting their propensity to travel. They claim as their territory a much larger range than other California Tribes, including all the Mojave Desert and as far south as the Turtle, Granite, and Eagle Mountains (CSRI 2002), thus encompassing the Iron Mountain SEZ. This larger range was where they hunted and gathered to supplement their planted crops and the fish they took from the river. They are likely to have traded, hunted, and gathered in the Iron Mountain SEZ area, harvesting mesquite pods to supplement their cultivated crops. Ward Valley has been identified by them as a camping and gathering location (CRSI 1987). They were less reliant on hunting and gathering than the Chemehuevi who hunted and gathered in much of the same area (Farmer et al. 2009).

The Mohave were well known as travelers, both for trade and to visit neighboring Tribes. They established the Mohave Trail and participated in a trading network that stretched from the Pacific Coast to the Pueblos of the Southwest. The Serrano were among their trading partners as were the Chumash and the Chemehuevi.

In addition to travel for trade, war, and recreation, trails often had religious significance. The Salt Song Trail seems to have originated with the Mohave. The Mohave revere other trails such as the Keruk Trail of Dreams. The song cycles that are associated with the trails tied specific songs to specific places. Many of these were considered places of power, where individuals sought enlightenment, skills, and status through dreaming. These trails are considered sacred, and offerings continue to be left at sacred points along them (Halmo 2003).

Halchidhoma

The Halchidhoma were a Yuman-speaking group located south of the Mohave along the Colorado River. Like the Mohave they were floodplain cultivators and active traders. Culturally they were similar to the Mohave and the Quechan, but politically they were their enemies. Their ties were with the Maricopa and Cocopah, also Yuman speakers. Like the Mohave they were great travelers and traders, establishing the Coco-Maricopa or Halchidhoma Trail, and east-west route later followed by Euro-American immigrants. This trail passes well south of the Iron Mountain SEZ (CSRI 2002). Their clashes with the Mohave and Quechan came to a head some time around 1825. The Halchidhoma were defeated and began to move to the Gila River to join their Maricopa allies. This process continued until about 1840 (Harwell and Kelly 1983).

Cahuilla

The Cahuilla occupied the Coachella Valley around Lake Cahuilla. They are believed to have entered the Colorado Desert from the Great Basin sometime between 500 B.C. and A.D. 500. They were hunters and gatherers living in permanent villages near reliable water. They appear to have first settled on the shores of Lake Cahuilla[12] and then moved to the mountains as the lake dried. The Cahuilla tended toward larger groups consisting of multiple lineages (Lightfoot and Parish 2009). Preferred settlement sites were near mesquite stands or palm oases. They considered the latter to be sacred (Bean et al. 1978). While villages were occupied year-round, small groups would move seasonally to temporary camps to collect localized plant resources or to hunt. Larger groups would travel to the mountains together with mountain allies to harvest piñon nuts and acorns. These would be brought to the permanent villages for storage. Species important to the Cahuilla are discussed in Section 9.2.18.

The Cahuilla were long-distance traders. The routes westward through the San Gorgonio Pass to the coast lay within their traditional use area, and the Cahuilla maintained trading relationships east of the Colorado River with the Maricopa. Like the Chemehuevi, they were part of a network that stretched as far east as the Great Plains (Bean et al. 1978).

Serrano

Less is known of the Serrano, whose precise sociopolitical boundaries are difficult to define. They derive their name from a Spanish term for highlander or mountaineer. Most researchers place the Serrano groups in the San Bernardino Mountains east of the Cajon Pass, north of Victorville in the Mojave River drainage and as far east as Twentynine Palms. Because of their relative proximity to the Iron Mountain SEZ and their association with the Chemehuevi, they deserve mention here.

The Serrano were a collection of localized lineages speaking the same language and sharing the same culture, but with little or no overarching political structure. The Serrano appear to have been primarily gatherers, supplementing their plant-based diet with hunting and fishing. The altitude varies considerably within their traditional range, and, as with neighboring groups, resources were collected in a number of environments. Most villages were found in the foothills, but some occurred on the desert floor in locations where good water was available. At higher

[12] Lake Cahuilla formed when the Colorado River shifted course to the west and flowed into the Salton Sea Basin, then dried when the river reverted to its former course. The process of formation and desiccation was cyclical before the construction of dams on the Colorado River, with cycles lasting about 150 years (Redlands Institute 2002).

elevations, they gathered piñon nuts and acorns, and at lower elevations mesquite pods and yucca heads. Where the resource was abundant, lineages might gather to harvest or to communally hunt rabbits or deer (Bean and Smith 1978).

Limited by water supply, villages were small and consisted of clusters of tule-thatched, domed, circular huts. Most often, they also included a larger ceremonial structure where the lineage leader lived. Their material culture included decorated baskets, pottery, hide blankets, stone pipes, yucca fiber cordage, and an assortment of musical instruments of wood, bone, and shell similar to the material culture of the Cahuilla (Farmer et al. 2009).

The Serrano had little contact with the Spanish until 1819 when an *asistencia*, or mission outpost, was established near Redlands. Thereafter, native lifeways rapidly faded as the majority of the population was moved to the missions. By the latter part of the twentieth century, most Serrano lived on the Morongo and San Manuel Reservations (Bean and Smith 1978).

9.2.17.1.3 History

European explorers first entered the southeastern California deserts in the sixteenth century. Early explorers of Alta California reached the Colorado River by way of the Gulf of California and proceeded up stream past the confluence of the Gila River, but explored little of the interior deserts. For the next 200 years, Spanish penetration of the interior deserts was intermittent resulting in a prolonged protohistoric period (see Sections 9.2.17.1.1 and 9.2.17.1.2). Juan Bautista de Anza crossed the Colorado River with the assistance of the Quechan on his way to Monterey in 1774. His route, which is located well south of the Iron Mountain SEZ near the border of California and Mexico, became the main travel corridor between Arizona and central California in the 1800s.

The nineteenth and early twentieth centuries were characterized by mining and prospecting both in the Colorado and Mojave Deserts. Gold, silver, copper, gypsum, borax, and manganese were the primary deposits of interest. A series of military camps and forts were established in Arizona, Nevada, and California between 1848 and 1890 to protect those moving into the area from hostile Tribes; tensions had increased between settlers and Native Americans as a result of mass migration to the area during the Gold Rush. In addition to the trail initially established by de Anza, Jedediah Smith created a new trail into California in 1826 that passed through present-day Needles north of the SEZ. This new development in the deserts was dependent on water and transportation. In 1872, the Southern Pacific Railroad started its way toward California; by 1877, it reached Yuma, Arizona, and by 1880, the Chocolate Mountains southeast of the SEZ. Water did not come to the Colorado Desert until the 1930s when the Metropolitan Water District was created and work began on the CRA from Parker Dam to Los Angeles; it was completed in 1938. Mining increased in the area during World Wars I and II as the need for metals (gold, silver, and manganese) increased.

In 1942, the U.S. Army identified 18,000 mi^2 (46,600 km^2) of desert in California and Arizona for training troops in a desert environment in preparation for combat in North Africa. The area came to be known as the Desert Training Center/California–Arizona Maneuver Area, or DTC/C-AMA, in 1943, as the massive training facility expanded its size to 31,500 mi^2 (81,600 km^2) and its range of activities from training troops, testing and developing equipment and supplies, and developing new techniques and tactics for desert warfare to large-scale training and maneuvering. It is estimated that more than 1 million men trained at the DTC/C-AMA. Although it only operated between 1942 and 1944, it represents a significant period in American history and includes a number of archaeological features of importance, including the remains of training camps, airfields, bivouacs, maneuver areas, and tank tracks (Bischoff 2000).

The larger context for the DTC is the early days of United States involvement in WWII. The German army was advancing across Europe, and the Italian army had struck out in Libya and Egypt. British forces had been able to successfully counterattack the Italian army but resulted in Germany entering North Africa to help the Italians. General Erwin Rommel of the German army was successful with his desert army advancing across Libya and then into Egypt against the British. The prospect of Germany and Italy controlling Egypt and the Japanese successes in India propelling them toward Persia, leaving Russia wide open to attack, made it clear to the United States that it would need to go to North Africa. General Lesley J. McNair, Chief of Staff or the Army General Headquarters, recognized the need for preparing American soldiers for desert warfare in a terrain similar to that of North Africa. He placed Major General George S. Patton, Jr., who had previously conducted successful training maneuvers in Louisiana, in charge of the desert training center project (Bischoff 2000).

The location of the DTC was determined in March of 1942 as General Patton toured the desert. Aside from the mountain ranges, the uninhabited desert of eastern California was deemed sufficiently similar to that of North Africa. Patton believed that the area was ideal for large-scale training exercises because it was remote and desolate, but yet water was available and three railroads supplied the area. In addition, there were other military facilities nearby (in Riverside, Las Vegas, Indio, Yuma, and Blythe). Patton worked out deals with the railroad companies (Union Pacific, Santa Fe, and Southern Pacific) and the Municipal Water District in order to supply transportation and water for the troops. Camp Young was the first camp established near what is today named Chiriaco Summit, and it became the DTC headquarters. Camp Iron Mountain and a camp in Needles were established next. The camps were all of temporary construction, mostly tents with some wooden structures to house administrative centers or hospitals. The only permanent construction was open-air chapels and large relief maps. By late summer of 1942, Patton was ordered to North Africa under Operation Torch, where he successfully commanded the western task force of the operation to victory. The DTC was quickly placed under the command of Major General Alvan Gillem, and the first set of maneuvers was conducted in the fall. This first set of maneuvers was considered unrealistic, and the DTC was ordered to act like a theater of operations in a combat setting, including the establishment of communications zones and combat zones. This was the first time the Army simulated a theater of operation. Riverine operations across the Colorado River were also added. At its height, the DTC contained 14 camps, 11 in California and 3 in Arizona, each capable of holding at least 15,000 soldiers during a typical 14-week training schedule. There were also airfields, hospitals, supply depots, and railheads. Rice Airfield, southeast of the Iron Mountain SEZ, was one of four main army airfields for the DTC; air support was considered an integral part of the desert training experience. On-the-ground troops needed to be able to conceal themselves as much as possible to prevent detection during simulated air attacks. In 1943, as the need for desert training waned with the close of the North African campaign, the concept and name of the DTC changed to the California–Arizona Maneuver Area (C-AMA). Its mission was to conduct broader based large-scale training to toughen soldiers mentally and physically and provide battle conditions for conducting firing training and for testing and developing equipment, supplies, and training methods. The DTC/C-AMA saw its greatest amount of activity during the summer and fall of 1943. In late 1943, personnel shortages (due to the need for personnel overseas) resulted in inefficient operation of the C-AMA, and General McNair recommended that the facility be closed. The DTC/C-AMA was declared surplus in April 1944 by the War Department and was closed by the end of the month (Bischoff 2000).

Of specific interest in the vicinity of the Iron Mountain SEZ are Camp Iron Mountain and Camp Granite. Camp Iron Mountain, located immediately adjacent to the proposed Iron Mountain SEZ to the southwest, was one of the first divisional camps constructed in the spring of 1942. It consisted of 15 shower buildings, 26 latrine buildings, 113 pyramidal tents of varying sizes (single, double, and triple), an amphitheater, two chapels, and several water supply installations (BLM 1984). Four firing ranges associated with the Iron Mountain Divisional Camp were located west and north of the camp; a fifth was located to the south at Palen Pass (BLM 1984). Camp Granite was established the summer of 1943 and contained nine artillery ranges just south of the main camp. It is located at the base of the Granite Mountains south of Camp Iron Mountain.

9.2.17.1.4 Traditional Cultural Properties—Landscape

As mentioned previously, the Tribes in this part of California have a holistic cosmology; they see the features of their environment as an interconnected whole imbued with a life force. Prominent features may be seen as places of power, as sacred places. High hills and mountains tend to be regarded as sacred, although some peaks have special status. Other features that tend to be regarded as sacred include caves, certain rock formations, springs and hot springs. Revered locations include panels of rock art, evidence of ancestral settlements, burial or cremation areas, and systems of trails. Sacred sites are often seen as places of power where offerings are left (Halmo 2003). The Tribes see themselves as exercising divinely given responsibilities of stewardship over the lands where they believe they were created and as retaining a divine birthright to those lands. Specific mountain peaks are seen as points of emergence associated with creation stories. Although adopting much of the Mohave cosmology, the Tribes have retained their own identities. For example, the Chemehuevi have their own mountain of creation, Charleston Peak in Nevada (Halmo 2003), distinct from the Mohave's *Avikwaaame* (Spirit Mountain) or Newberry Peak, also in Nevada. As mentioned previously, there remains considerable interaction among the Tribes that inhabit the southeastern California deserts. A system of alliances furthered trade and the sharing of hunting and gathering grounds.

From the Native American perspective, the Iron Mountain SEZ is situated within a sacred landscape tied together by a network of sacred trails. The Chemehuevi have identified important trails in the general area, one of which may pass through the southern part of the SEZ. The most important trail is the Salt Song Trail. Generally, it runs north–south and links the mountains of creation in Nevada with other sacred mountains in the south—Palo Verde Peak and when tied to the *Xan Kwakham Trail*, *Avikwala*, or Pilot Knob (Johnson 2003). While close to the SEZ, it lies to the west. It follows the western slope of the Old Woman Mountains in Fenner Valley, crosses the smaller western arm of Ward Valley then proceeds southward west of the Iron Mountains into Palen Valley (CSRI 1987). Except where it crosses the shorter arm of Ward Valley, it is separated from the Iron Mountain SEZ by mountains. Native American groups from around the region, including the Fort Mohave, Chemehuevi, Cocopah, Quechan, and Colorado River Indian Tribes, who all share reverence for the Salt Song Trail, protested strenuously when an attempt was made to establish a low-level radioactive waste repository at the northern end of Ward Valley because of its association with the Salt Song Trail and because of concerns over groundwater contamination (Ridder 1998).

Another trail important to the Chemehuevi, leading from the Chemehuevi Valley to Twentynine Palms and the Pacific Coast, although not sacred, crosses Ward Valley well north of the proposed SEZ, while a more southerly east-west route connecting Parker, Arizona, with the coast, crosses Ward Valley to the Iron Mountains, most likely traversing the SEZ.

Other mountains considered sacred include the Big Maria, Coxcomb, Old Woman, Riverside, and Providence Mountains (Halmo 2003). Of these, the Old Woman Mountains are adjacent to and northwest of the Iron Mountain SEZ and form the western wall of Ward Valley. The Riverside and Big Maria Mountains are visible through a gap in the mountains that surround the SEZ, while the other mountains are shielded from view. It is possible that trails connecting the mountains pass through the SEZ. There are other geophysical features that the Chemehuevi deem culturally important and connected to local features. These stretch from the Eagle Mountains to the southwest to the Grand Canyon of the Colorado River to the northeast. These are not visible from the SEZ, nor would development in the SEZ be visible from them. The Chemehuevi have also identified the Cadiz Valley located west of the Iron Mountains as culturally important and have taken refuge in the Turtle Mountains northeast of the SEZ during times of conflict.

The Ward Valley contains extensive seasonal collection areas, some of which are still used by the Chemehuevi. There are temporary and permanent campsites throughout the valley. Danby Lake in the southeastern part of the SEZ was an important area for food and salt collection. Numerous campsites are reported from around the lake. A trail along the southern side of the lake may well be part of the east-west trail leading from Parker, Arizona, to the Pacific Coast (CSRI 1987).

According to a Sacred Lands File Search through the Native American Heritage Commission, Native American burials have been recorded in 12 Township and Range sections wholly or partially included in the proposed Iron Mountain SEZ. An additional burial is located in a section adjacent to the proposed SEZ, and a village site has been recorded in a section that lies partially within the SEZ (Singleton 2010).

9.2.17.1.5 Cultural Surveys and Known Archaeological and Historic Resources

At least three linear surveys have been conducted within the proposed Iron Mountain SEZ, resulting in the recording of three sites within the SEZ and two additional sites just west of the SEZ. Three additional sites, not associated with the linear surveys, have been recorded in the area, for a total of six recorded sites within the SEZ. Approximately seven sites lie within the Ward Valley, including the two mentioned previously, that are located just outside of the SEZ, but within 5 mi (8 km) of it. Five additional sites are recorded within 5 mi (8 km) of the SEZ but are in locations within and/or beyond (on the other side of) the Iron Mountains or Turtle Mountains with respect to the SEZ; these are not in locations that have the potential to be affected by solar development in the valley and are therefore not discussed further.[13]

More specifically, a BLM report was published in 1977 regarding a sample survey of the Cadiz Valley/Danby Lake Interim Critical Management Area 37. Twenty-two transects (0.125 mi × 1.0 mi [0.2 km × 1.6 km]) were randomly selected and systematically surveyed across a 278 mi^2 (720 km^2) area. Twenty-one sites were recorded, including the following two sites in the Iron Mountain SEZ: a salt mine and a prehistoric camp with a very large lithic scatter,[14] and the Iron Mountain Divisional Camp just outside of the SEZ. In 1980, a 200-ft (61-m) wide corridor was surveyed following the centerline of a proposed racecourse, including a portion crossing Danby Lake and the Iron Mountains. An isolated basalt mortar was recorded just west of the SEZ, but no artifacts were recorded within the corridor that was surveyed within the SEZ. In the 1980s, an archaeological survey was conducted for the All-American Pipeline, a 1,223-mi (1,968-km) heated oil pipeline from Santa Barbara, California, to McCamey, Texas. The specific segment of the All-American Pipeline within the proposed Iron Mountain SEZ was surveyed in 1985, and four sites were recorded (two prehistoric artifact scatters and two historic trash scatters).

Of the six sites within the SEZ, three are prehistoric and three are historic. One of the prehistoric sites is clearly eligible for listing on the NRHP and is located on the edge of Danby Lake. It is a Pinto complex site with Pinto series projectile points and milling tools representative of the complex. The other two are predominantly lithic scatters, one of which has some milling tools present. Historic period sites include a surface trash scatter consisting of metal, glass, and ceramic artifacts, a hearth with associated bottle glass and shell bead, and a salt mining evaporation basin (ca. 1920s) within the Danby Lake bed.

A portion of the Iron Mountain Divisional Camp is located within the SEZ. This camp is eligible for the NRHP as representative and the best preserved of the 14 camps within the DTC-C-AMA. Two open-air chapels and a surviving relief map (although affected over time by sheet wash erosion) are extant at the site, as well as stone-lined walkways, unit symbols, and insignias. The 200-ft × 175-ft (61-m × 53-m) relief map represents the entire DTC/C-AMA to scale. The map is now fenced, and a diversion channel was dug uphill to prevent further erosion. There are two other known relief maps, but the one at Iron Mountain is the best preserved. The only other known chapel is at Camp Coxcomb (Bischoff 2000). Camp Granite is located on the other side of the highway just south of the SEZ and Camp Iron Mountain, and Camp Rice and Rice Army Airfield are located to the southeast of the SEZ. Camp Granite, Camp Rice, and Rice Army Airfield are potentially eligible for listing in the NRHP (Bischoff 2000). The close proximity of

[13] Survey and site information was provided by the BLM Needles Field Office.

[14] Appears to have been initially recorded as three separate sites out of the 21 recorded, but results in one BLM site form.

these military sites increases the likelihood of military features and artifacts being present within the SEZ. Property types identified as associated with important World War II training activities within the DTC/C-AMA include the divisional camps, airfields, landing strips, bivouacs, maneuver areas, ranges, training areas, campsites, hospitals, quartermaster depots, railroad sidings, tank tracks, and refuse deposits (Bischoff 2000). At least a portion of one of the five firing ranges appears to have been located within the western part of the Iron Mountain SEZ, according to a map referenced in the *Iron Mountain Divisional Camp Resource Management Plan* (BLM 1984). Tank tracks also were observed within portions of the SEZ during a preliminary site visit in August 2009.

Just west of the northwest corner of the SEZ is the railroad section camp and the townsite of Milligan. The camp would have been established around 1913 to 1917 (based on the railroad going in about 1913 and an approximate date for the cemetery at 1917) and likely abandoned in the 1930s. The site has not been formally evaluated for the NRHP, other than being determined potentially eligible for purposes of a sodium-related project in the area. It consists of a few foundations, including a foundation of the station master's house; a cemetery with approximately 10 graves; ornamental rock planters around palo verde trees; a water tank; and an area where tent platforms would have been set up. It is located just south of the Atchison Topeka & Santa Fe Railroad just outside of the sodium mining operations; the cemetery is just north of the tracks. Section camps were strategically established during railroad construction in remote areas near water sources for railroad maintenance purposes. The community population could have reached about 40 people, but was at times as few as 4 to 5 families (Murray 2009).

Also adjacent to the proposed SEZ, in the northwest, is a lithic scatter with Lake Mojave points (possibly reused lanceolate points from an earlier period) on a former Danby Lake shoreline. This site is potentially eligible for listing in the NRHP.

The BLM has designated several locations relatively close to the proposed Iron Mountain SEZ as ACECs because of their significant cultural value. The Iron Mountain Divisional Camp ACEC is adjacent to the SEZ, although portions of the historic archaeological site extend outside the boundaries of the ACEC. It was designated an ACEC in 1980 as the best preserved of the World War II camps in California and Arizona. The Mopah Spring ACEC is 7 mi (11 km) northeast of the SEZ; it was designated for its outstanding scenery and its cultural resources. The Palen Dry Lake ACEC is 25 mi (40 km) south of the SEZ and is designated for its prehistoric sites. Additional ACECs are present beyond a 25-mi (40-km) radius of the SEZ; they have been designated for their archaeological resources and Native American values and are reflective of the cultural landscape. These include the Big Marias ACEC (Arizona) 26 mi (42 km) southeast of the SEZ; Alligator Rock and Corn Springs ACECs 30 mi (38 km) and 34 mi (55 km), respectively, southwest of the SEZ; Whipple Mountains ACEC 33 mi (53 km) east of the SEZ; and Mule Mountains ACEC 38 mi (61 km) south of the SEZ.

National Register of Historic Places

There are no historic properties listed in the NRHP within the SEZ or within 5 mi (8 km) of the SEZ. However, the Iron Mountain Divisional Camp is eligible for listing in the NRHP and has been recommended as a representative site for the DTC/C-AMA for management purposes (BLM 1984). Although it is not yet listed, it has been designated an ACEC by the BLM to better protect its cultural values. The Pinto complex site that is located within the SEZ is also eligible for listing in the NRHP, and so is the Lake Mojave site adjacent to the SEZ.

9.2.17.2 Impacts

Direct impacts on significant cultural resources during site preparation and construction activities could occur in the proposed Iron Mountain SEZ; however, as stated in Section 9.2.17.1, further investigation is needed. A cultural resource survey of the entire area of potential effects would first be required to identify archaeological sites, historic structures and features, and traditional cultural properties, and an evaluation would follow to determine whether any are eligible for listing in the NRHP. Ward Valley, as a whole, and Danby Lake, in particular, were important areas for gathering both salt and food resources for both the Mohave and Chemehuevi. The remains of campsites are scattered throughout the valley, and there are panels of rock art in the adjacent mountains. These locations remain important both as resource areas and for their archaeological sites. Activities associated with the World War II DTC were also prominent in the valley, and physical remnants of those activities, as well as tank tracks, are present within the SEZ. Possible impacts from solar energy development on cultural resources that are encountered within the SEZ or along related ROWs are described in more detail in Section 5.15. Impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2. Programmatic design features assume that the necessary surveys, evaluations, and consultations will occur.

Programmatic design features to reduce water runoff and sedimentation would prevent the likelihood of indirect impacts on cultural resources resulting from erosion outside of the SEZ boundary (including along ROWs). These programmatic design features will be especially important in areas near the Iron Mountain Divisional Camp, as erosion has had an effect on the integrity of several features at the site. Indirect impacts on cultural resources through vandalism or theft are possible given the large size of the SEZ and its accessibility, as well as its proximity to areas of significance to Tribes (see below) and historic resources like the Iron Mountain Camp and Milligan townsite.

No new access roads or transmission lines have been assessed for the proposed Iron Mountain SEZ, assuming existing corridors would be used; impacts on cultural resources related to the creation of new corridors would be evaluated at the project-specific level if new road or transmission construction or line upgrades are to occur.

Because of the interconnectedness of the landscape in Native American cosmology, a change in one part affects the whole; thus damage to one part of the sacred landscape would affect the entire network. The proposed Iron Mountain SEZ is located near to where the Salt Song Trail crosses the southern end of Ward Valley. Native Americans have expressed concern over the visual impacts of development on segments of the Salt Song Trail (Halmo 2003). It is likely that development of the Iron Mountain SEZ would be visible from the southern end of the Old Woman Mountains (see Section 9.2.14). The Iron Mountain SEZ is not pristine wilderness;

it is crossed by a railroad line, includes the remains of an abandoned settlement, is actively leased for sodium extraction, and is scarred by tank tracks dating from World War II. However, the construction of an extensive solar energy facility would very likely have more visual impact on the landscape surrounding the mountains than already exists. Native Americans have also expressed concern over other impacts likely to accompany development (Halmo 2003). The presence of an industrial facility and the associated increase in traffic and workers are likely to have a negative impact on the qualities that render a site sacred. An increase in the number of people in the area would increase the potential for damage to panels of rock art and the disturbance of burials and archaeological sites. While the development of the Iron Mountain SEZ would necessarily increase the number of people coming to and working in Ward Valley, this impact should be greatest during the construction and decommissioning phases of a facility. The operation of a solar facility would require fewer personnel (see Section 9.2.19.2).

9.2.17.3 SEZ-Specific Design Features and Design Feature Effectiveness

Programmatic design features to mitigate adverse effects on significant cultural resources, such as avoidance of burials and significant sites and cultural awareness training for the workforce, are provided in Appendix A, Section A.2.2.

SEZ-specific design features would be determined in consultation with the California SHPO and affected Tribes. Consultation efforts should include discussions on significant archaeological sites and traditional cultural properties and on sacred sites and trails with views of the proposed SEZ. SEZ-specific design features could include the following:

- Avoidance of NRHP-eligible sites (historic properties) within the proposed SEZ, specifically in the vicinity of Danby Lake and near the Iron Mountain Divisional Camp, is recommended.

- Because of the possibility for burials in the vicinity of the proposed Iron Mountain SEZ and its location along the Salt Song Trail interconnecting a sacred landscape and its associated sites, it is recommended that for surveys conducted in the SEZ, consideration be given to include Native American representatives in the development of survey designs and historic property treatment and monitoring plans.

- Troops in training for World War II often used the same locations that Native Americans did for similar purposes (CSRI 1987). Any excavation of historic sites should take into consideration the potential for the co-location of prehistoric and ethnohistoric components.

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9.2.18 Native American Concerns

As discussed in Section 9.2.17, many Native Americans view their environment holistically. This section focuses on concerns that are specific to Native Americans and to which Native Americans bring a distinct perspective. For a discussion of issues of possible Native American concern, several sections in this PEIS should be consulted. General topics of concern are addressed in Section 4.16. Specifically for the proposed Iron Mountain SEZ, Section 9.2.17 discusses archaeological sites, structures, landscapes, trails, and traditional cultural properties; Section 9.2.8 discusses mineral resources; Section 9.2.9.1.3 discusses water rights and water use; Section 9.2.10 discusses plant species; Section 9.2.11 discusses wildlife species, including wildlife migration patterns; Section 9.2.13 discusses air quality; Section 9.2.14 discusses visual resources; Sections 9.2.19 and 9.2.20 discuss socioeconomics and environmental justice, respectively; and issues of human health and safety are discussed in Section 5.21.

Many Native Americans view the whole of the landscape as imbued with a life force, including features and objects viewed by Euro-American cultures as inanimate. The importance of landscapes, geophysical features, trails, rock art, and archaeological sites is discussed in Section 9.2.17. This section focuses on other Native American concerns, including those that have an ecological as well as cultural component. For many Native Americans, the taking of game or the gathering of plants or other natural resources is seen as both a sacred and secular act (Stoffle et al. 1990).

Information has been sought from all federally recognized tribes with traditional ties to the Colorado Desert, including the Iron Mountain SEZ. Because Tribal land claims are overlapping and because conflicts among the Tribes and with Euro-Americans resulted in the dispersal of much of the original population, contacts have been initiated with a wide net of Tribes that are likely to include descendants of the indigenous inhabitants of the area. Table 9.2.18-1 lists the Tribes contacted with traditional ties to the SEZs in southeastern California. Contacts with all federally recognized Tribes are presented in Appendix K. The concerns of Native Americans, including the Chemehuevi, Mohave, Cahuilla, and Serrano, over other energy development projects in the region also have been documented and are summarized in the next section. These comments provide important insights into their concerns over energy development in the area.

9.2.18.1 Affected Environment

As discussed in Section 9.2.17, the territorial boundaries of the tribes that inhabited the Colorado Desert appear to have been fluid over time. At times they overlapped, and resources were shared where abundant. The boundaries considered here are those presented by the tribes themselves to the Indian Claims Commission in the 1950s. While the commission recognized the individual claims for the Chemehuevi, Mohave, and Quechan, most of California, including much of the southeastern part of the state, was judged to be the common territory of the "Indians of California" and is so shown on maps of judicially established Native American land claims (Royster 2008). This category was created by Congress to accommodate the claims of Native Americans who had lost their identity as distinct tribes, bands, or villages because of the arrival

TABLE 9.2.18-1 Federally Recognized Tribes with Traditional Ties to the Southeastern California SEZs

Tribe	Location	State
Agua Caliente Band of Cahuilla Indians	Palm Springs	California
Cabazon Band of Cahuilla Mission Indians	Indio	California
Cahuilla Band of Mission Indians	Anza	California
Campo Kumeyaay Nation	Campo	California
Chemehuevi Indian Tribe	Havasu Lake	California
Cocopah Indian Tribe	Somerton	Arizona
Colorado River Indian Tribes	Parker	Arizona
Ewiiaapaayp Band of Kumeyaay Indians	Alpine	California
Fort Majave Indian Tribe	Needles	California
La Posta Band of Kumeyaay Indians	Boulevard	California
Los Coyotes Band of Cahuilla & Cupeno Indians	Warm Springs	California
Manzanita Band of Kumeyaay Indians	Boulevard	California
Morongo Band of Mission Indians	Banning	California
Quechan Indian Tribe of the Fort Yuma Reservation	Yuma	Arizona
Salt River Prima-Maricopa Indian Community	Scottsdale	Arizona
San Manuel Band of Mission Indians	Patton	California
Soboba Band of Luiseño Indians	San Jacinto	California
Sycuan Band of the Kumeyaay Nation	El Cajon	California
Torres-Martinez Desert Cahuilla Indians	Thermal	California
Twenty-Nine Palms Band of Mission Indians	Coachella	California
Viejas Band of Kumeyaay Indians	Alpine	California

and policies of Euro-Americans (Indian Claims Commission 1958). The claims of the Serrano and Cahuilla lie within the Indians of California territory but were also presented individually to the commission. These claims appear to respect the claims made by neighboring Tribes. The Mohave submitted two claims. One claim accepted by the commission was restricted to areas along the Colorado River, the other, reflecting their view that they were the original inhabitants of southeastern California and all others late-comers, includes much of Chemehuevi and Indians of California territory (Indian Claims Commission 1958; CSRI 2002).

9.2.18.1.1 Territorial Boundaries

Chemehuevi

Maps of Native American territorial boundaries in southeastern California usually show the southern end of Ward Valley, where the proposed Iron Mountain SEZ is located, as being in Chemehuevi territory. Iron Mountain is in the southern lobe of the territory they claimed. Their territory stretches from the Chemehuevi Reservation on the Colorado River on the east, west as far as Soda Lake beyond the Bristol Mountains, and north of the Newberry Mountains (CSRI 2002). Chemehuevi descendants may be found on the Chemehuevi Reservation and among the Twentynine Palms Band of Mission Indians.

Mohave

The territory claimed by the Mohave includes almost all land claimed by the Chemehuevi and overlaps with Serrano claims. It extends as far west as the Tehachapi and San Gabriel Mountains. They see themselves as the original people to dwell in the Colorado Desert. The others are latecomers or distant branches of the Mohave. Their claimed territory includes the northern portion of Ward Valley, and it is likely that the resources of the Iron Mountain SEZ were shared (CSRI 2002). Mohave Indians may be found on the Fort Mohave Reservation and the Colorado River Reservation.

Serrano

The Serrano were friendly trading partners of the Chemehuevi. Their territorial claims lie just to the south of Chemehuevi territory. The proposed Iron Mountain SEZ is close to the border between the two claims. Given the variable nature of the claims and the important salt deposits near Danby Lake, it is likely that the Serrano had access to the valley as well (CSRI 2002). Serrano descendants may be found among the San Manual and Morongo Bands of Mission Indians.

Cahuilla

The Coachella Valley lies at the heart of Cahuilla territory, well to the southwest of the proposed Iron Mountain SEZ. However, their eastward territorial claims extend to just west of Blythe, California, which is south of the proposed Iron Mountain SEZ. However, given their relative proximity and their propensity for long-distance trading and travel, it is likely that the SEZ was part of their broader range (CRSI 2002). Cahuilla descendants may be found on many reservations, including those of the Morongo, Agua Caliente, Cabazon, Cahuilla, Los Coyotes, and Torres-Martinez Bands.

9.2.18.1.2 Plant Resources

The traditional Native American subsistence base in the Colorado Desert was a combination of floodplain agriculture and hunting and gathering. The proportion of farming to gathering varies with the tribe. The margins of Danby Lake may have periodically supported traditional farming, but Ward Valley is more closely associated with the harvesting of wild plants. Traditionally, Native American Tribes in the Colorado Desert practiced a seasonal round in harvesting naturally occurring plant resources. For example, agave heads are harvested in early spring, mesquite produced a summer crop, and fall might include harvests of pine nuts or acorns at higher elevations (Lightfoot and Parish 2009). Proximity to valuable plant resources and water were important factors in determining where Native Americans chose to build their villages and camps. Native Americans commenting on nearby development projects have voiced concern over the loss of culturally important plants used for food, medicine, and ritual purposes and for making tools, implements, and structures. The plant communities observed or likely to be present at the Iron Mountain SEZ are discussed in Section 9.2.10. Danby Lake is classified as North American Warm Desert Playa. While most of the valley floor on either side of the lake has been characterized as Sonora-Mojave Creosotebush-White Bursage Desert Scrub, a small area of Sonora-Mojave Mixed Salt desert Scrub is present to the north of the lake (NatureServe 2008). The valley bottom is dominated by creosote and burrobush, with mesquite present in the washes.

Table 9.2.18.1-2 lists plants important to Native Americans that were either observed at the Iron Mountain SEZ or are possible members of the cover type plant communities that have been defined for the SEZ. These plants are the dominant species; however, other plants important to Native Americans could occur in the SEZ, depending on localized conditions and the season. Food plants are present in the Iron Mountain SEZ, although they do not appear to be dominant. Food plants had other uses as well. The most important is mesquite, found in the washes of the SEZ. Its long bean-like pods are harvested in the summer, can be stored, and were widely traded in the past; its blossoms are also edible. Traditionally, mesquite groves were managed by burning. Mesquite trunks also traditionally served as a source of wood; fiber from its inner bark was made into string, its thorns were used for tattooing; and its gum was used as an adhesive, a cleansing agent, and medicine. Native Americans also harvest and eat a variety of cactus fruits and yucca heads in season. Jojoba produces an edible nut that can be ground into a meal and also has medicinal uses. Saltbush seeds can be harvested, processed, and eaten (Lightfoot and Parish 2009).

TABLE 9.2.18.1-2 Plant Species Important to Native Americans Observed or Likely To Be Present in the Proposed Iron Mountain SEZ

Common Name	Scientific Name	Status
Food		
Beavertail Prickly Pear Cactus	*Opuntia basilaris*	Observed
California Barrel Cactus	*Ferocactus cylindraceus*	Nearby
Cholla Cactus	*Cylindropuntia* spp.	Observed
Honey Mesquite	*Prosopia Glandolosa*	Observed
Jojoba	*Simmondsia chinensis*	Nearby
Saltbush	*Atriplex* spp.	Observed
Yucca	*Yucca* sp.	Observed
Medicine		
Creosotebush	*Larrea tridentata*	Observed
Greasewood	*Adenotsoma fasciculatum*	Observed
Squaw tea	*Ephedra nevadensis*	Possible
Ritual		
Ironwood	*Olneya tesota*	Observed
Raw Material		
Desert-Willow	*Chilopsis linaeris*	Observed

Sources: Field visit; Lightfoot and Parrish (2009); NatureServe (2008).

The proposed Iron Mountain SEZ includes other plants useful to Native Americans. The leaves of the dominant creosotebush are widely made into tea for medicinal purposes. The trunks of greasewood can be used in construction, while its leaves and branches are used in curing, as is a tea made from *Ephedra nevadensis*, or Mormon tea. Desert willow is used in basketry (Lightfoot and Parish 2009), while ironwood is considered sacred by the Cahuilla (Bean et al. 1978).

9.2.18.1.3 Other Resources

The proposed Iron Mountain SEZ was also likely a hunting ground. It lies across the route taken by bighorn sheep, *Ovis Canadensis*, moving from one mountain range to the next. Ward Valley is also known as a good location to hunt rabbits (CSRI 1987). Other animal species traditionally used by Native Americans that are likely to occur in the SEZ are listed in Table 9.2.18.1-3.

Mineral resources important to Native Americans in the Colorado Desert include clay suitable for making pottery, stone suitable for the manufacture of both cutting and grinding tools, hematite for pigment, and quartz crystals considered to have healing properties (Halmo 2003).

As long-time desert dwellers, Native Americans have a great appreciation for the importance of water in a desert environment. They have expressed concern over the use and availability of water for solar energy installations (Halmo 2003; Jackson 2009). One of the main

TABLE 9.2.18.1-3 Animal Species Used by Native Americans Whose Range Includes the Proposed Iron Mountain SEZ

Common Name	Scientific Name	Status
Mammals		
Bighorn sheep	*Ovis Canadensis*	All year
Black-tailed jack rabbit	*Lepus californicus*.	All year
Bobcat	*Lynx rufus*	All year
Coyote	*Canis latrans*	All year
Desert cottontail	*Silvilagus audubonii*	All year
Squirrels	*Spermophilus* sp. & *Ammospermophilus* sp.	All year
Wood rats	*Neotoma* spp.	All year
Birds		
Gambel's quail	*Callipepla gambelii*	All year
Mourning dove	*Zenaida macroura*	All year
Reptiles		
Desert tortoise	*Gopherus Agassizii*	All year
Rattlesnakes	*Crotalus* spp.	All year

Sources: Lightfoot and Parrish (2009); Fowler (1986); Stewart (1983).

concerns over past industrial development planned in Ward Valley was the contamination of ground water, which they see as ultimately flowing to the Colorado River and affecting the basin as a whole (CSRI 1987; Ridder 1998).

Some Tribes share with the populace as a whole concerns over potential danger from electromagnetic fields. In traditional Cahuilla culture, electricity, both natural (lightning) and artificially generated, is considered dangerous and something to be avoided (Bean et al. 1978). They may have concerns over a facility that produces electricity and its associated transmission system.

In addition, Native Americans have expressed concern over ecological segmentation, that is, development that fragments animal habitat and does not provide corridors for movement. They would prefer solar energy development take place on land that has already been disturbed, such as abandoned farmland, rather than on undisturbed ground.

9.2.18.2 Impacts

To date, no comments have been received from the Tribes specifically referencing the proposed Iron Mountain SEZ. However, the Native American Land Conservancy (NALC), an inter-tribal organization, has expressed concern over culturally important sites in the Iron Mountains and sites associated with the Salt Song Trail (Russo 2009). Likewise, the Chemehuevi Indian Tribe has previously expressed concerns over the Salt Song Trail, which passes just west of the SEZ (Ridder 1998; Halmo 2003). Solar development within the SEZ is likely to be visible from the trail. In a response letter, the Quechan Indian Tribe of the Fort Yuma Indian Reservation stressed the importance of evaluating impacts on landscapes as a whole. Because trails have both physical and spiritual components, the intrusion of industrial development nearby would negatively affect the trails (Jackson 2009).

The impacts that would be expected from solar energy development within the Iron Mountain SEZ on resources important to Native Americans fall into two major categories: impacts on the landscape and impacts on discrete localized resources.

Potential landscape-scale impacts are those caused by the presence of an industrial facility within a culturally important landscape that includes sacred mountains and other geophysical features tied together by a network of sacred trails. Impacts may be visual—the intrusion of an industrial feature in sacred space; audible—noise from the construction, operation or decommissioning of a facility detracting from the traditional cultural values of the site; or demographic—the increased presence of outsiders in the area increasing the chance that the sacredness of the area would be degraded by more foot and motorized traffic in the area. As consultation continues and additional analyses are undertaken, it is possible that there will be Native American concerns expressed over potential visual effects of solar energy development within the SEZ on the landscape, such as on Old Woman Mountain, Turtle Mountains, the Salt Song Trail, and/or on the valley as a whole (see also Section 9.2.17).

Localized effects could occur both within the SEZ and in adjacent areas. Within the SEZ these effects would include destroying or degrading important plant resources, destroying the habitat of and impeding the movement of culturally important animal species, destroying archaeological sites and burials, and the degradation or destruction of trails. Known resources of this type within the SEZ tend to be associated with Danby Lake. Any ground-disturbing activity associated with the development within the SEZ has the potential for destruction of localized resources. Since solar energy facilities cover large tracts of ground, even taking into account the implementation of design features, it is unlikely that avoidance of all resources would be possible. Programmatic design features (see Appendix A, Section A.2.2) assume that the necessary cultural surveys, site evaluations, and tribal consultations will occur. As discussed in Sections 9.2.11 and 9.2.12, the effects of development in the proposed SEZ are expected to be moderate. Significant areas of habitat would remain in the region. As discussed in Section 9.2.10.2, effects on native plant species are expected to be small, because the affected cover types would remain abundant in the region.

Affects on resources in surrounding areas include the landscape intrusions discussed above and the potential for the degradation of such features as trails, rock art, shrines, and sacred places in the surrounding mountains. This degradation could result from increased traffic and increased numbers of people in the area, especially during construction and decommissioning phases of the project.

Implementation of programmatic design features, as discussed in Appendix A, Section A.2.2, should eliminate impacts on Tribes' reserved water rights and the potential for groundwater contamination issues.

9.2.18.3 SEZ-Specific Design Features and Design Feature Effectiveness

Programmatic design features to mitigate impacts of potential concern to Native Americans, such as avoidance of burials, sacred sites, water sources, and Tribally important plant and animal species, are provided in Appendix A, Section A.2.2.

The development of solar energy facilities in the state of California requires developers to follow CEC guidelines for interacting with Native Americans in addition to Federal requirements (CEC 2009). Developers must obtain information from California's NAHC on the presence of Native American sacred sites in the project vicinity and a list of Native Americans who want to be contacted about proposed projects in the region. Table 9.2.18.3-1 lists the tribes recommended for contact by the NAHC.

The need for and nature of SEZ-specific design features regarding potential issues of concern, such as burials and the Salt Song Trail, would be determined during government-to-government consultation with affected Tribes.

The NALC has recommended that the agencies hold a series of listening sessions with the affected Tribes (such as those listed in Table 9.2.18.3-1) and meet with the leaders of the Salt Song Tradition to gain a better understanding of the Salt Song cultural landscape (Russo 2009).

TABLE 9.2.18.3-1 Federally Recognized Tribes Listed by the NAHC to Contact Regarding the Proposed Iron Mountain SEZ

Tribe	Location	State
Agua Caliente Band of Cahuilla Indians	Palm Springs	California
Chemehuevi Indian Tribe	Havasu Lake	California
Cocopah Indian Tribe	Somerton	Arizona
Colorado River Indian Tribes	Parker	Arizona
Fort Mojave Indian Tribe	Needles	California
Morongo Band of Mission Indians	Banning	California
Quechan Indian Tribe of the Fort Yuma Reservation	Yuma	Arizona
San Manuel Band of Mission Indians	Patton	California
Torres-Martinez Desert Cahuilla Indians	Thermal	California
Twentynine Palms Band of Mission Indians	Coachella	California

Source: Singleton (2010).

In addition, the Quechan Tribe has requested that it be consulted at the inception of any solar energy project. The Quechan also suggest that the clustering of large solar energy facilities be avoided; that priority for development be given to lands that have already been disturbed by agricultural or military use; and that the feasibility of placing solar collectors on existing structures be considered, thus minimizing or avoiding the use of undisturbed land (Jackson 2009).

Mitigation of impacts on archaeological sites and traditional cultural properties is discussed in Section 9.2.17.3, in addition to programmatic design features for historic properties discussed in Appendix A, Section A.2.2.

9.2.19 Socioeconomics

9.2.19.1 Affected Environment

This section describes current socioeconomic conditions and local community services within the ROI surrounding the proposed Iron Mountain SEZ. The ROI is a two-county area comprising Riverside and San Bernardino Counties in California. It encompasses the area in which workers are expected to spend most of their salaries and in which a portion of site purchases and nonpayroll expenditures from the construction, operation, and decommissioning phases of the proposed SEZ facility are expected to take place.

9.2.19.1.1 ROI Employment

In 2008, employment in the ROI stood at 1,646,312 (Table 9.2.19.1-1). Over the period 1999 to 2008, the annual average employment growth rate was slightly higher in Riverside County (2.5%) than in San Bernardino County (1.2%). At 1.9%, growth rates in the ROI as a whole were higher than the average rate for California (0.9%).

In the ROI in 2006, the services sector provided the highest percentage of employment at 44.9%, followed by wholesale and retail trade at 20.7% (Table 9.2.19.1-2). Smaller employment shares were held by construction (10.7%) and manufacturing (10.7%). Within the two counties in the ROI, the distribution of employment across sectors is similar to that of the ROI as a whole, but employment in construction (13.8%) and in agriculture (3.0%) was higher in Riverside County than in the ROI as a whole.

TABLE 9.2.19.1-1 ROI Employment in the Proposed Iron Mountain SEZ

Location	1999	2008	Average Annual Growth Rate, 1999–2008 (%)
Riverside County	653,552	839,878	2.5
San Bernardino County	712,624	806,434	1.2
ROI	1,366,176	1,646,312	1.9
California	15,566,900	17,059,574	0.9

Sources: U.S Department of Labor (2009a,b).

TABLE 9.2.19.1-2 ROI Employment in the Proposed Iron Mountain SEZ by Sector, 2006

	Riverside County		San Bernardino County		ROI	
Sector	Employment	% of Total	Employment	% of Total	Employment	% of Total
Agriculture[a]	17,064	3.0	5,143	0.9	22,207	1.9
Mining	505	0.1	846	0.1	1,351	0.1
Construction	78,556	13.8	45,700	7.7	124,256	10.7
Manufacturing	56,582	9.9	67,306	11.4	123,888	10.7
Transportation and public utilities	21,835	3.8	49,871	8.5	71,706	6.2
Wholesale and retail trade	116,343	20.4	124,321	21.1	240,664	20.7
Finance, insurance, and real estate	26,964	4.7	28,760	4.9	55,724	4.8
Services	252,847	44.3	267,674	45.4	520,521	44.9
Other	89	0.0	46	0.0	135	0.0
Total	570,468		589,803		1,160,271	

[a] Agricultural employment includes 2007 data for hired farm workers.

Sources: U.S. Bureau of the Census (2009a); USDA (2009).

9.2.19.1.2 ROI Unemployment

Unemployment rates have been similar in both counties in the ROI. Over the period 1999 to 2008, the average rate in Riverside County was 6.0%, slightly higher than the rate in San Bernardino County (5.6%) (Table 9.2.19.1-3). The average rate in the ROI over this period was 5.8%, the same as the average rate for California (5.8%). Unemployment rates for the first 10 months of 2009 contrast with rates for 2008 as a whole; in Riverside County, the unemployment rate increased to 13.8%, while in San Bernardino County the rate reached 13.1%. The average rates for the ROI (13.5%) and for California as a whole (11.6%) were also higher during this period than the corresponding average rates for 2008.

9.2.19.1.3 ROI Urban Population

The population of the ROI in 2006 to 2008 was 74% urban, with the majority of urban areas located in the western portion of the ROI. The largest city, Riverside, had an estimated 2006 to 2008 population of 293,207; other large cities in the western portion of the county include San Bernardino (198,014), Moreno Valley (188,676), Fontana (186,689), Ontario (170,947), and Rancho Cucamonga (170,057) (Table 9.2.19.1-4). In addition, there are 2 cities in the county with a 2008 population of between 100,000 and 150,000, and 16 cities with between 50,000 and 99,999 persons. All these cities are part of the larger urban region that includes Los Angeles, Riverside, and San Bernardino, and most are more than 100 mi (161 km) from the site of the proposed SEZ.

Population growth rates among the larger cities in the western part of the ROI have varied over the period 2000 to 2008 (Table 9.2.19.1-4). Murrieta grew at an annual rate of 10.4% during this period, with higher than average growth also experienced in Lake Elsinore (7.1%), Victorville (6.9%), Temecula (6.5%), San Jacinto (5.9%), Fontana (4.7%), Hesperia (3.9%), and Rancho Cucamonga (3.6%). The cities of Hemet (2.3%), Corona (2.2%), and

TABLE 9.2.19.1-3 ROI Unemployment Rates for the Proposed Iron Mountain SEZ (%)

Location	1999–2008	2008	2009[a]
Riverside County	6.0	8.6	13.8
San Bernardino County	5.6	8.0	13.1
ROI	5.8	8.3	13.5
California	5.8	7.2	11.6

[a] Rates for 2009 are the average for January through November.

Sources: U.S. Department of Labor (2009a–c).

TABLE 9.2.19.1-4 ROI Urban Population and Income for the Proposed Iron Mountain SEZ

	Population			Median Household Income ($ 2008)		
City	2000	2008	Average Annual Growth Rate, 2000–2008 (%)	1999	2006–2008	Average Annual Growth Rate, 1999 and 2006–2008 (%)[a]
Riverside	255,166	293,207	1.8	53,620	56,805	0.6
San Bernardino	185,401	198,014	0.8	40,093	40,764	0.2
Moreno Valley	142,381	188,676	3.6	61,101	55,178	–1.1
Fontana	128,929	186,869	4.7	58,945	62,914	0.7
Ontario	158,007	170,947	1.0	54,658	57,184	0.5
Rancho Cucamonga	127,743	170,057	3.6	78,450	79,455	0.1
Corona	124,966	148,336	2.2	76,755	78,120	0.2
Victorville	64,029	109,313	6.9	46,591	52,507	1.3
Rialto	91,873	98,376	0.9	53,115	50,000	–0.7
Murrieta	44,282	97,935	10.4	78,424	79,135	0.1
Temecula	57,716	95,853	6.5	76,628	77,394	0.1
Hesperia	62,582	85,236	3.9	51,759	48,160	–0.8
Indio	49,116	83,475	6.9	44,579	53,824	2.1
Chino	67,168	82,435	2.6	71,330	72,373	0.2
Chino Hills	66,787	73,527	1.2	100,908	103,706	0.3
Upland	68,393	71,760	0.6	62,746	67,803	0.9
Hemet	58,812	70,821	2.3	34,556	34,974	0.1
Redlands	63,591	69,394	1.1	62,000	65,539	0.6
Perris	36,189	55,150	5.4	45,774	53,442	1.7
Cathedral City	42,647	51,790	2.5	50,068	42,026	–1.9
Highland	44,605	50,870	1.7	53,084	60,963	1.5
Palm Desert	41,155	50,490	2.6	62,208	55,218	–1.3
Colton	47,662	50,333	0.7	46,063	46,411	0.1
Lake Elsinore	28,928	50,229	7.1	53,926	58,496	0.9
La Quinta	23,694	43,229	7.8	70,237	78,898	1.3
Coachella	22,724	39,014	7.0	36,810	40,463	1.1
San Jacinto	23,779	37,475	5.9	39,433	47,127	2.0
Montclair	33,049	36,231	1.2	52,527	58,094	1.1
Twentynine Palms	28,854	33,354	1.8	40,142	43,447	0.9
Adelanto	18,130	28,330	5.7	40,678	41,875	0.3
Norco	24,157	26,455	1.1	80,537	78,141	–0.3
Barstow	21,119	24,392	1.8	45,152	48,042	0.7
Desert Hot Springs	16,582	23,996	4.7	33,459	38,465	1.6
Blythe	12,155	21,650	7.5	45,480	37,937	–2.0
Loma Linda	18,681	21,515	1.8	49,188	55,091	1.3
Yucca Valley	16,865	20,290	2.3	39,166	45,298	1.6
Rancho Mirage	13,249	16,651	2.9	77,027	NA	NA
Grand Terrace	11,626	12,160	0.6	69,074	NA	NA
Canyon Lake	9,952	11,064	1.3	90,263	NA	NA
Calimesa	7,139	7,478	0.6	48,731	NA	NA
Big Bear Lake	5,438	6,102	1.5	44,351	NA	NA
Needles	4,830	5,293	1.2	33,614	NA	NA
Indian Wells	3,816	5,113	3.7	121,008	NA	NA

[a] Data are averages for the period 2006 to 2008.

Source: U.S. Bureau of the Census (2009b–d).

Riverside (1.8%) all experienced lower growth rates between 2000 and 2008. The cities of Rialto (0.9%), San Bernardino (0.8%), Colton (0.7%), and Upland (0.6%) all experienced growth rates of less than 1% between 2000 and 2008.

Riverside County contains a smaller group of cities located about 80 mi (129 km) from the SEZ site: Indio (83,475), Cathedral City (51,790), Palm Desert (50,490), Coachella (39,014), La Quinta (43,229), and Desert Hot Springs (23,996). Population growth in these cities between 2000 and 2008 has been relatively high: La Quinta (7.8%), Coachella (7.0%), Indio (6.9%), and Desert Hot Springs (4.7%). One city, Blythe (21,650), is located on the eastern border of the county, on the Colorado River, less than 10 mi (16 km) from the proposed SEZ location and had a relatively high population growth rate (7.5%) between 2000 and 2008.

A number of smaller cities are located in San Bernardino County, to the east of the San Bernardino area, within about 70 mi (113 km) of the site of the proposed SEZ. Twentynine Palms (2008 population of 33,354) and Yucca Valley (20,290) are located on the perimeter of the Twentynine Palms Marine Corps base and the Joshua Tree National Monument, and are primarily retail centers, while Barstow (24,392) is a rail and road transportation and retail center. Population growth in these cities between 2000 and 2008 has been low, with annual growth rates of 2.3% in Yucca Valley and 1.8% in Twentynine Palms. Needles (5,293) is located on the Colorado River, more than 100 mi (161 km) from the proposed SEZ location, and also had a relatively low population growth rate (1.2%) between 2000 and 2008.

9.2.19.1.4 ROI Urban Income

Median household incomes varied considerably across cities in the ROI. A number of cities in western Riverside County—Murrieta ($79,135), Norco ($78,141), and Temecula ($77,394)—had median incomes in 2006 to 2008 that were higher than the average for the state ($61,154) (Table 9.2.19.1-4). A number of cities in the western portion of the county had relatively low median household incomes, notably Hemet ($34,974) and San Jacinto ($47,127). A number of cities in the western San Bernardino County—Chino Hills ($103,706), Rancho Cucamonga ($79,455), Chino ($72,373), Upland ($67,803), Redlands ($65,539), and Fontana ($62,914)—had median incomes in 2006 to 2008 that were higher than the average for the state ($61,154) (Table 9.3.19.1-4). A number of cities in the western portion of the county had relatively low median household incomes, notably San Bernardino ($40,764), Adelanto ($41,875), Colton ($46,411), and Hesperia ($48,160).

In the western part of Riverside County, median income growth rates between 1999 and 2006 to 2008 were highest in San Jacinto (2.0%), Perris (1.7%), with annual growth rates of less than 1% elsewhere. Moreno Valley (–1.1%) and Norco (–0.3%) had negative growth rates between 1999 and 2006 to 2008. The average median household income growth rate for the state as a whole over this period was less than 0.1%. Among the cities in the western part of San Bernardino County, median income growth rates between 2000 and 2006 to 2008 were highest in Highland (1.5%), Victorville (1.3%), Loma Linda (1.3%), and Montclair (1.1%), with annual growth rates of less than 1% elsewhere. Hesperia (–0.8%) and Rialto (–0.7%) had negative growth rates between 1999 and 2006 to 2008. The average median household income growth rate for the state as a whole over this period was less than 0.1%.

In the cities in central and eastern Riverside County, La Quinta ($78,898) had a median household income higher than the state average between 2006 and 2008, while other cities, Palm Desert ($55,218), Indio ($53,824), Cathedral City ($42,026), Coachella ($40,463), and Desert Hot Springs ($38,465) had median incomes less than the state average. Median income in Blythe in 2006 to 2008 was $37,937. Growth rates in these cities over the period 1999 and 2006 to 2008 varied from 2.1% in Indio to –2.0% in Blythe. Of the cities in central and eastern San Bernardino County, Barstow ($48,042) and Yucca Valley ($45,298) both had median household incomes less than the state average between 2006 and 2008. Median income in Needles in 2000 was $33,614. Growth rates in these cities over the period 1999 and 2006 to 2008 varied from 1.6% in Yucca Valley to 0.9% in Twentynine Palms.

9.2.19.1.5 ROI Population

Table 9.2.19.1-5 presents recent and projected populations in the ROI and state as a whole. Population in the ROI stood at 4,092,831 in 2008, having grown at an average annual rate of 2.9% since 2000. Growth rates for the two counties in the ROI were higher than those in California (1.5%) over the same period.

Both counties in the ROI experienced growth in population between 2000 and 2008; population in Riverside County grew at an annual rate of 3.8%, while in San Bernardino County, population grew by 2.0%. The ROI population is expected to increase to 5,584,241 by 2021 and to 5,780,284 by 2023.

TABLE 9.2.19.1-5 ROI Population for the Proposed Iron Mountain SEZ

Location	2000	2008	Average Annual Growth Rate, 2000–2008 (%)	2021	2023
Riverside County	1,559,039	2,087,917	3.8	2,965,113	3,085,643
San Bernardino County	1,721,942	2,004,914	2.0	2,619,128	2,694,641
ROI	3,280,981	4,092,831	2.9	5,584,241	5,780,284
California	33,871,648	38,129,628	1.5	44,646,420	45,667,413

Sources: U.S. Bureau of the Census (2009e,f); California Department of Finance (2010).

9.2.19.1.6 ROI Income

Total personal income in the ROI stood at $121.2 billion in 2007 and has grown at an annual average rate of 3.4% over the period 1998 to 2007 (Table 9.2.19.1-6). Per-capita income also rose over the same period at a rate of 0.7%, increasing from $27,779 to $29,736. Per-capita incomes were higher in Riverside County ($30,713) than in San Bernardino County ($29,132) in 2007. Growth rates in total personal income have been slightly higher in Riverside County; with growth in per-capita incomes higher in San Bernardino County (0.8%). Personal income growth rates in both counties in the ROI were higher than the state rate (2.5%), but per-capita income growth rates in the ROI (0.7%) were slightly lower than in California as a whole (1.1%).

Median household income in 2006 to 2008 varied from $56,575 in San Bernardino County to $58,168 in Riverside County (U.S. Bureau of the Census 2009d).

9.2.19.1.7 ROI Housing

In 2007, more than 1,433,500 housing units were located in the two ROI counties, with about 53% of these located in Riverside County (Table 9.2.19.1-7). Owner-occupied units

TABLE 9.2.19.1-6 ROI Personal Income for the Proposed Iron Mountain SEZ

Location	1998	2007	Average Annual Growth Rate, 1998–2007 (%)
Riverside County			
Total income[a]	42.2	63.1	4.1
Per-capita income	28,886	30,713	0.6
San Bernardino County			
Total income[a]	44.1	58.1	2.8
Per-capita income	26,797	29,132	0.8
ROI			
Total income[a]	86.3	121.2	3.4
Per-capita income	27,779	29,736	0.7
California			
Total income[a]	1,231.7	1,573.6	2.5
Per-capita income	37,339	41,821	1.1

[a] Unless indicated otherwise, values are reported in $ billion 2008.

Sources: U.S. Department of Commerce (2009); U.S. Bureau of the Census (2009e,f).

TABLE 9.2.19.1-7 ROI Housing Characteristics for the Proposed Iron Mountain SEZ

Parameter	2000	2007[a]
Riverside County		
Owner-occupied	348,532	446,017
Rental	157,686	201,426
Vacant units	78,456	106,972
Seasonal and recreational use	38,208	NA[b]
Total units	584,674	754,415
San Bernardino County		
Owner-occupied	340,933	381,697
Rental	187,661	207,361
Vacant units	72,775	90,111
Seasonal and recreational use	31,657	NA
Total units	601,369	679,169
ROI		
Owner-occupied	689,465	827,714
Rental	345,347	408,787
Vacant units	151,231	197,083
Seasonal and recreational use	69,865	NA
Total units	1,186,043	1,433,584

[a] 2007 data for number of owner-occupied, rental, and vacant units for California counties are not available; data are based on 2007 total housing units and 2000 data on housing tenure.

[b] NA = data not available.

Sources: U.S. Bureau of the Census (2009h–j).

compose approximately 67% of the occupied units in the two counties, with rental housing making up 33% of the total. Vacancy rates in 2007 were 14.2% in Riverside County and 13.3% in San Bernardino County; 6.5% of housing units in Riverside County and 5.3% in San Bernardino County was used for seasonal or recreational purposes. With an overall vacancy rate of 13.7% in the ROI, there were 197,083 vacant housing units in the ROI in 2007, of which 65,156 are estimated to be rental units that would be available to construction workers. There were 69,865 units in seasonal, recreational, or occasional use at the time of the 2000 Census.

Housing stock in the ROI as a whole grew at an annual rate of 2.7% over the period 2000 to 2007, with 247,541 new units added to the existing housing stock (Table 9.2.19.1-6).

The median value of owner-occupied housing in 2008 varied from $366,600 in San Bernardino County to $380,600 in Riverside County (U.S. Bureau of the Census 2009g).

9.2.19.1.8 ROI Local Government Organizations

The various local and county government organizations in Riverside County are listed in Table 9.2.19.1-8. In addition, three Tribal governments are located in the county, with members of other Tribal groups located in the state, but whose Tribal governments are located in adjacent states.

9.2.19.1.9 ROI Community and Social Services

This section describes educational, health care, law enforcement, and firefighting resources in the ROI.

Schools

In 2007, the two-county ROI had a total of 1,019 public and private elementary, middle, and high schools (NCES 2009). Table 9.2.19.1-9 provides summary statistics for enrollment and educational staffing and two indices of educational quality—student-teacher ratios and levels of service (number of teachers per 1,000 population). The student-teacher ratio in Riverside County schools (22.1) is slightly lower than that in San Bernardino County schools (24.3), while the level of service is slightly higher in Riverside County (9.3) than in San Bernardino County, where there are fewer teachers per 1,000 population (8.8).

Health Care

The total number of physicians (4,176) and the number of physicians per 1,000 population (2.1) in San Bernardino County is slightly higher than in Riverside County (3,277, 1.6) (Table 9.2.19.1-10).

Public Safety

Several state, county, and local police departments provide law enforcement in the ROI (Table 9.2.19.1-11). San Bernardino County has 1,783 officers and would provide law enforcement services to the SEZ; there are 1,965 officers in Riverside County. Levels of service of police protection are 1.0 per 1,000 population in Riverside County and 0.9 in San Bernardino County. Currently, there are 3,498 professional firefighters in the ROI (Table 9.2.19.1-11).

9.2.19.1.10 ROI Social Change

Various energy development studies have suggested that once the annual growth in population is between 5 and 15% in smaller rural communities, alcoholism, depression, suicide, social conflict, divorce, and delinquency would increase and levels of community satisfaction

TABLE 9.2.19.1-8 ROI Local Government Organizations and Social Institutions in the Proposed Iron Mountain SEZ

Governments	
City	
Adelanto	Lake Elsinore
Apple Valley	Loma Linda
Barstow	Montclair
Big Bear Lake	Moreno Valley
Blythe	Murrieta
Calimesa	Needles
Canyon Lake	Norco
Cathedral City	Ontario
Chino	Palm Desert
Chino Hills	Perris
Coachella	Rancho Cucamonga
Colton	Rancho Mirage
Corona	Redlands
Desert Hot Springs	Rialto
Fontana	Riverside
Grand Terrace	San Bernardino
Hemet	San Jacinto
Hesperia	Temecula
Highland	Twentynine Palms
Indian Wells	Upland
Indio	Victorville
La Quinta	Yucca Valley
County	
Riverside County	San Bernardino County
Tribal	
Agua Caliente Band of Cahuilla Indians of the Agua Caliente Indian Reservation, California	
Augustine Band of Cahuilla Mission Indians of the Augustine Reservation, California	
Cabazon Band of Mission Indians, California	
Cahuilla Band of Mission Indians of the Cahuilla Reservation, California	
Chemehuevi Indian Tribe of the Chemehuevi Reservation, California	
Ione Band of Miwok Indians of California	
Morongo Band of Cahuilla Mission Indians of the Morongo Reservation, California	
Pechanga Band of Luiseno Mission Indians of the Pechanga Reservation, California	
Ramona Band or Village of Cahuilla Mission Indians of California	
San Manuel Band of Serrano Mission Indians of the San Manuel Reservation, California	
Santa Rosa Band of Cahuilla Indians, California	
Soboba Band of Luiseno Indians, California	
Torres Martinez Desert Cahuilla Indians, California	
Twenty-Nine Palms Band of Mission Indians of California	

Sources: U.S. Bureau of the Census (2009b); U.S. Department of the Interior (2010).

TABLE 9.2.19.1-9 ROI School District Data for the Proposed Iron Mountain SEZ, 2007

Location	Number of Students	Number of Teachers	Student-Teacher Ratio	Level of Service[a]
Riverside County	421,642	19,105	22.1	9.3
San Bernardino County	427,603	17,568	24.3	8.8
ROI	849,245	36,673	23.2	9.1

[a] Number of teachers per 1,000 population.

Source: NCES (2009).

TABLE 9.2.19.1-10 Physicians in the ROI for the Proposed Iron Mountain SEZ, 2007

Location	Number of Primary Care Physicians	Level of Service[a]
Riverside County	3,277	1.6
San Bernardino County	4,176	2.1
ROI	7,453	1.8

[a] Number of physicians per 1,000 population.

Source: AMA (2009).

TABLE 9.2.19.1-11 Public Safety Employment in the ROI for the Proposed Iron Mountain SEZ

Location	Number of Police Officers[a]	Level of Service[b]	Number of Firefighters[c]	Level of Service
Riverside County	1,965	1.0	2,205	1.1
San Bernardino County	1,783	0.9	1,293	0.6
ROI	3,748	0.9	3,498	0.9

[a] 2007 data.

[b] Number per 1,000 population.

[c] 2008 data; number does not include volunteers.

Sources: Department of Justice (2008); Fire Departments Network (2009).

would deteriorate (BLM 1980, 1983, 1996). Data on violent crime and property crime rates and on alcoholism and illicit drug use, metal health, and divorce, which might be used as indicators of social change, are presented in Tables 9.2.19.1-12 and 9.2.19-1.13, respectively.

There is some variation in the level of crime across the ROI, with slightly higher rates of violent crime in San Bernardino County (4.6 per 1,000 population) than in Riverside County (3.5) (Table 9.2.19.1-12). Property-related crime rates are also slightly higher in San Bernardino County (29.6) than in Riverside County (27.5); that is, overall crime rates in San Bernardino County (34.2) were slightly higher than in Riverside County (31.0).

Other measures of social change—alcoholism, illicit drug use, and mental health—are not available at the county level and thus are presented for the SAMHSA region in which the ROI is located. There is some variation across the two regions in which the two counties are located; rates for alcoholism and illicit drug are slightly higher in the region in which Riverside County is located and rates of mental illness are slightly higher in the region in which San Bernardino County is located (Table 9.2.19.1-13).

9.2.19.1.11 ROI Recreation

Various areas in the vicinity of the proposed Iron Mountain SEZ are used for recreational purposes, with natural, ecological, and cultural resources in the ROI attracting visitors for a range of activities, including hunting, fishing, boating, canoeing, wildlife watching, camping, hiking, horseback riding, mountain climbing, and sightseeing. These areas are discussed in Section 9.2.5.

TABLE 9.2.19.1-12 County and ROI Crime Rates for the Proposed Iron Mountain SEZ[a]

	Violent Crime[b]		Property Crime[c]		All Crime	
Location	Offenses	Rate	Offenses	Rate	Offenses	Rate
Riverside County	7,351	3.5	57,839	27.5	65,190	31.0
San Bernardino County	9,657	4.6	61,713	29.6	71,370	34.2
ROI	17,008	4.1	119,552	28.5	135,560	32.6

[a] Rates are the number of crimes per 1,000 population.

[b] Violent crime includes murder and non-negligent manslaughter, forcible rape, robbery, and aggravated assault.

[c] Property crime includes burglary, larceny, theft, motor vehicle theft, and arson.

Sources: U.S. Department of Justice (2009a,b).

TABLE 9.2.19.1-13 Alcoholism, Drug Use, Mental Health, and Divorce in the Proposed Iron Mountain SEZ ROI[a]

Geographic Area	Alcoholism	Illicit Drug Use	Mental Health[b]	Divorce[c]
California Region 12 (includes San Bernardino County)	7.1	2.6	8.8	–[d]
New Mexico Region 13 (includes Riverside County)	8.5	3.2	8.6	–
California				4.3

[a] Data for alcoholism and drug use represent percentage of the population over 12 years of age with dependence or abuse of alcohol, illicit drugs. Data are averages for 2004 to 2006.

[b] Data for mental health represent percentage of the population over 18 years of age suffering from serious psychological distress. Data are averages for 2002 to 2004.

[c] Divorce rates are the number of divorces per 1,000 population. Data are for 1990.

[d] A dash indicates date not available.

Sources: SAMHSA (2009); CDC (2009).

Because the number of visitors using state and federal lands for recreational activities is not available from the various administering agencies, the value of recreational resources in these areas, based solely on the number of recorded visitors, is likely to be an underestimation. In addition to visitation rates, the economic valuation of certain natural resources can also be assessed in terms of the potential recreational destination for current and future users, that is, their nonmarket value (see Section 5.17.1.1).

Another method is to estimate the economic impact of the various recreational activities supported by natural resources on public land in the vicinity of the proposed solar development, by identifying sectors in the economy in which expenditures on recreational activities occur. Not all activities in these sectors are directly related to recreation on state and federal lands, with some activity occurring on private land (e.g., dude ranches, golf courses, bowling alleys, and movie theaters). Expenditures associated with recreational activities form an important part of the economy of the ROI. In 2007, 141,993 people were employed in the ROI in the various sectors identified as recreation, constituting 8.5% of total ROI employment (Table 9.2.19.1-14). Recreation spending also produced almost $3,374 million in income in the ROI in 2007. The primary sources of recreation-related employment were eating and drinking places.

9.2.19.2 Impacts

The following analysis begins with a description of the common impacts of solar development, including common impacts on recreation and on social change. These impacts would occur regardless of the solar technology developed in the SEZ. The impacts of facilities employing various solar energy technologies are analyzed in detail in subsequent sections.

TABLE 9.2.19.1-14 Recreation Sector Activity in the Proposed Iron Mountain SEZ ROI, 2007

ROI	Employment	Income ($ million)
Amusement and recreation services	7,223	221.1
Automotive rental	2,158	112.9
Eating and drinking places	105,700	2,071.9
Hotels and lodging places	11,357	376.2
Museums and historic sites,	432	27
Recreational vehicle parks and campsites	1,389	39.6
Scenic tours	6,211	361.0
Sporting goods retailers	7,523	163.9
Total ROI	141,993	3,373.7

Source: MIG, Inc. (2009).

9.2.19.2.1 Common Impacts

Construction and operation of a solar energy facility at the proposed Iron Mountain SEZ would produce direct and indirect economic impacts. Direct impacts would occur as a result of expenditures on wages and salaries, procurement of goods and services required for project construction and operation, and the collection of state sales and income taxes. Indirect impacts would occur as project wages and salaries, procurement expenditures, and tax revenues subsequently circulate through the economy of each state, thereby creating additional employment, income, and tax revenues. Facility construction and operation would also require in-migration of workers and their families into the ROI surrounding the site, which would affect population, rental housing, health service employment, and public safety employment. Socioeconomic impacts common to all utility-scale solar energy facilities are discussed in detail in Section 5.17. These impacts will be minimized through the implementation of programmatic design features described in Appendix A, Section A.2.2.

Recreation Impacts

Estimating the impact of solar facilities on recreation is problematic because it is not clear how solar development in the SEZ would affect recreational visitation and nonmarket values (i.e., the value of recreational resources for potential or future visits; see Section 5.17.1.2.3). While it is clear that some land in the ROI would no longer be accessible for recreation, the majority of popular recreational locations would be precluded from solar development. It is also possible that solar development in the ROI would be visible from popular recreation locations and that construction workers temporarily residing in the ROI would occupy accommodation otherwise used for recreational visits, thus reducing visitation and consequently affecting the economy of the ROI.

Social Change

Although an extensive literature in sociology documents the most significant components of social change in energy boomtowns, the nature and magnitude of the social impact of energy development in small rural communities is still unclear (see Section 5.17.1.1.4). While some degree of social disruption is likely to accompany large-scale in-migration during the boom phase, there is insufficient evidence to predict the extent to which specific communities are likely to be affected, which population groups within each community are likely to be most affected, and the extent to which social disruption is likely to persist beyond the end of the boom period (Smith et al. 2001). Accordingly, because of the lack of adequate social baseline data, it has been suggested that social disruption is likely to occur once an arbitrary population growth rate associated with solar energy development projects has been reached, with an annual rate of between 5 and 10% growth in population assumed to result in a breakdown in social structures, with a consequent increase in alcoholism, depression, suicide, social conflict, divorce, delinquency, and deterioration in levels of community satisfaction (BLM 1980, 1983, 1996).

In overall terms, the in-migration of workers and their families into the ROI would represent an increase of less than 0.1% in county population during construction of the trough technology, with smaller increases for the power tower, dish engine and PV technologies, and during the operation of each technology. While it is possible that some construction and operations workers will choose to locate in communities closer to the SEZ, the lack of available housing in smaller rural communities in the ROI to accommodate all in-migrating workers and families and insufficient range of housing choices to suit all solar occupations, many workers are likely to commute to the SEZ from larger communities elsewhere in the ROI, thereby reducing the potential impact of solar development on social change. Regardless of the pace of population growth associated with the commercial development of solar resources and the likely residential location of in-migrating workers and families in communities some distance from the SEZ itself, the number of new residents from outside the ROI is likely to lead to some demographic and social change in small rural communities in the ROI. Communities hosting solar development are likely to be required to adapt to a different quality of life, with a transition away from a more traditional lifestyle involving ranching and taking place in small, isolated, close-knit, homogenous communities with a strong orientation toward personal and family relationships, toward a more urban lifestyle, with increasing cultural and ethnic diversity and increasing dependence on formal social relationships within the community.

9.2.19.2.2 Technology-Specific Impacts

The economic impacts of solar energy development in the proposed SEZ were measured in terms of employment, income, state tax revenues (sales and income), population in-migration, housing, and community service employment (education, health, and public safety). More information on the data and methods used in the analysis are provided in Appendix M.

The assessment of the impact of the construction and operation of each technology was based on SEZ acreage, assuming 80% of the area could be developed. To capture a range of possible impacts, solar facility size was estimated on the basis of the land requirements of various solar technologies, assuming that 9 acres/MW (0.04 km^2/MW) would be required for power tower, dish engine, and PV technologies and 5 acres/MW (0.02 km^2/MW) for solar trough technologies. Impacts of multiple facilities employing a given technology at each SEZ were assumed to be the same as impacts for a single facility with the same total capacity. Construction impacts were assessed for a representative peak year of construction, assumed to be 2021 for each technology. Construction impacts assumed that a maximum of three projects could be constructed within a given year, with a corresponding maximum land disturbance of up to 9,000 acres (36 km^2). For operations impacts, a representative first year of operations was assumed to be 2023 for trough and power tower, 2022 for the minimum facility size for dish engine and PV, and 2023 for the maximum facility size for these technologies. The years of construction and operations were selected as representative of the entire 20-year study period because they are the approximate midpoint; construction and operations could begin earlier.

Solar Trough

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of solar trough technologies would be up to 16,165 jobs (Table 9.2.19.2-2). Construction activities would constitute 0.7% of total ROI employment. A solar facility would also produce $969.0 million in income. Direct sales taxes would be $41.2 million, and direct income taxes, $18.8 million.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 2,229 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units would not be expected to be large, with 1,114 rental units expected to be occupied in the ROI. This occupancy rate would represent 1.2% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service employment (education, health, and public safety). An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, 21 new teachers, 4 physicians, and 4 public safety employee (career firefighters and uniformed police officers) would be required in the ROI. These increases would represent less than 0.1% of total ROI employment expected in these occupations.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using solar trough technologies would be 6,138 jobs (Table 9.2.19.2-2). Such a solar facility would also produce $230.3 million in income. Direct sales taxes would be $0.6 million, and direct income taxes, $5.9 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010c), acreage rental

TABLE 9.2.19.2-2 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Iron Mountain SEZ with Trough Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	5,232	3,713
Total	16,165	6,138
Income[b]		
Total	969.0	230.3
Direct state taxes[b]		
Sales	41.2	0.6
Income	18.8	5.9
In-migrants (no.)	2,229	473
BLM payments ($ million 2008)		
Rental	NA[d]	13.4
Capacity[e]	NA	112.0
Vacant housing[c] (no.)	1,114	426
Local community service employment		
Teachers (no.)	21	4
Physicians (no.)	4	1
Public safety (no.)	4	1

[a] Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 1,800 MW (corresponding to 9,000 acres [36 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 17,043 MW.

[b] Unless indicated otherwise, values are reported in $ million 2008.

[c] Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

[d] Not applicable.

[e] The BLM annual capacity payment was based on a fee of $6,570 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010c), assuming a solar facility with no storage capability and full build-out of the site. Projects with three or more hours of storage would generate higher payments, based on a fee of $7,884 per MW.

payments would be $13.4 million, and solar generating capacity payments, at least $112.0 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 473 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility operation on the number of vacant owner-occupied housing units would not be expected to be large, with 426 owner-occupied units expected to be occupied in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (health, education, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the provision of these services in the ROI. Accordingly, four new teachers, one physician, and one public safety employee would be required in the ROI.

Power Tower

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of power tower technologies would be up to 6,439 jobs (Table 9.2.19.2-3). Construction activities would constitute 0.3% of total ROI employment. Such a solar facility would also produce $385.9 million in income. Direct sales taxes would be less than $16.4 million, with direct income taxes of $7.5 million.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 888 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units would not be expected to be large, with 444 rental units expected to be occupied in the ROI. This occupancy rate would represent 0.5% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, eight new teachers, two physicians, and two public safety employees would be required in the ROI. These increases would represent less than 0.1% of total ROI employment expected in these occupations.

TABLE 9.2.19.2-3 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Iron Mountain SEZ with Power Tower Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	2,084	1,917
Total	6,439	2,671
Income[b]		
Total	385.9	93.1
Direct state taxes[b]		
Sales	16.4	0.1
Income	7.5	5.8
BLM payments ($ million 2008)		
Rental	NA[d]	13.4
Capacity[e]	NA	62.2
In-migrants (no.)	888	244
Vacant housing[c] (no.)	444	220
Local community service employment		
Teachers (no.)	8	2
Physicians (no.)	2	<1
Public safety (no.)	2	<1

a Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 1,000 MW (corresponding to 9,000 acres [36 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 9,469 MW.

b Unless indicated otherwise, values are reported in $ million 2008.

c Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

d Not applicable.

e The BLM annual capacity payment was based on a fee of $6,570 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010c), assuming a solar facility with no storage capability and full build-out of the site. Projects with three or more hours of storage would generate higher payments, based on a fee of $7,884 per MW.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using power tower technologies would be 2,671 jobs (Table 9.2.19.2-3). Such a solar facility would also produce $93.1 million in income. Direct sales taxes would be $0.1 million, and direct income taxes, $5.8 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010c), acreage rental payments would be $13.4 million, and solar generating capacity payments, at least $62.2 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a solar facility means that some in-migration of workers and their families from outside the ROI would be required, with 244 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels and mobile home parks) mean that the impact of solar facility operation on the number of vacant owner-occupied housing units would not be expected to be large, with 220 owner-occupied units expected to be required in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, two new teachers would be required in the ROI.

Dish Engine

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of dish engine technologies would be up to 2,618 jobs (Table 9.2.19.2-4). Construction activities would constitute 0.1% of total ROI employment. Such a solar facility would also produce $156.9 million in income. Direct sales taxes would be less than $6.7 million, and direct income taxes, $3.1 million.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 361 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units would not be expected to be large, with 180 rental units expected to be occupied in the ROI. This occupancy rate would represent 0.2% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, three new teachers, one physician, and one public safety employee would be required in the ROI. These increases would represent less than 0.1% of total ROI employment expected in these occupations.

TABLE 9.2.19.2-4 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Iron Mountain SEZ with Dish Engine Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	847	1,863
Total	2,618	2,596
Income[b]		
Total	156.9	90.5
Direct state taxes[b]		
Sales	6.7	0.1
Income	3.1	2.9
BLM payments ($ million 2008)		
Rental	NA[d]	13.4
Capacity[e]	NA	62.2
In-migrants (no.)	361	237
Vacant housing[c] (no.)	180	214
Local community service employment		
Teachers (no.)	3	2
Physicians (no.)	1	<1
Public safety (no.)	1	<1

a Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 1,000 MW (corresponding to 9,000 acres [36 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 9,469 MW.

b Unless indicated otherwise, values are reported in $ million 2008.

c Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

d Not applicable.

e The BLM annual capacity payment was based on a fee of $6,570 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010c), assuming a solar facility with no storage capability and full build-out of the site. Projects with three or more hours of storage would generate higher payments, based on a fee of $7,884 per MW.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using dish engine technologies would be 2,596 jobs (Table 9.2.19.2-4). Such a solar facility would also produce $90.5 million in income. Direct sales taxes would be $0.1 million, and direct income taxes, $2.9 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010c), acreage rental payments would be $13.4 million, and solar generating capacity payments, at least $62.2 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a dish engine solar facility means that some in-migration of workers and their families from outside the ROI would be required, with 237 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility operation on the number of vacant owner-occupied housing units would not be expected to be large, with 214 owner-occupied units expected to be required in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service employment (education, health, and public safety). An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, two new teachers would be required in the ROI.

Photovoltaic

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of PV technologies would be up to 1,221 jobs (Table 9.2.19.2-5). Construction activities would constitute 0.1 % of total ROI employment. Such a solar development would also produce $73.2 million in income. Direct sales taxes would be less than $3.1 million, and direct income taxes, $1.4 million.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 168 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units would not be expected to be large, with 84 rental units expected to be occupied in the ROI. This occupancy rate would represent 0.1% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, two new teachers would be required in the ROI. This increase would represent less than 0.1% of total ROI employment expected in this occupation.

TABLE 9.2.19.2-5 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Iron Mountain SEZ with PV Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	395	186
Total	1,221	259
Income[b]		
Total	73.2	9.0
Direct state taxes[b]		
Sales	3.1	<0.1
Income	1.4	0.6
BLM payments ($ million 2008)		
Rental	NA[d]	13.4
Capacity[e]	NA	49.8
In-migrants (no.)	168	24
Vacant housing[c] (no.)	84	21
Local community service employment		
Teachers (no.)	2	<1
Physicians (no.)	<1	<1
Public safety (no.)	<1	<1

[a] Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 1,000 MW (corresponding to 9,000 acres [36 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 9,469 MW.

[b] Unless indicated otherwise, values are reported in $ million 2008.

[c] Construction activities would affect vacant rental housing; operations activities would affect owner-occupied housing.

[d] Not applicable.

[e] The BLM annual capacity payment was based on a fee of $5,256 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010c), assuming full build-out of the site.

***Operations*.** Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using PV technologies would be 259 jobs (Table 9.2.19.2-5). Such a solar facility would also produce $9.0 million in income. Direct sales taxes would be less than $0.1 million, and direct income taxes, less than $0.6 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010c), acreage rental payments would be $13.4 million, and solar generating capacity payments, at least $49.8 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 24 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility operation on the number of vacant owner-occupied housing units would not be expected to be large, with 21 owner-occupied units expected to be required in the ROI.

No new community service employment would be required to meet existing levels of service in the ROI.

9.2.19.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features addressing socioeconomic impacts have been identified for the proposed Iron Mountain SEZ. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would reduce the potential for socioeconomic impacts during all project phases.

9.2.20 Environmental Justice

9.2.20.1 Affected Environment

On February 11, 1994, the President signed E.O. 12898, “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,” which formally requires federal agencies to incorporate environmental justice as part of their missions (*Federal Register*, Volume 59, page 7629, Feb. 11, 1994). Specifically, it directs them to address, as appropriate, any disproportionately high and adverse human health or environmental effects of their actions, programs, or policies on minority and low-income populations.

The analysis of the impacts of solar energy projects on environmental justice issues follows guidelines described in the Council on Environmental Quality’s (CEQ’s) *Environmental Justice Guidance under the National Environmental Policy Act* (CEQ 1997). The analysis method has three parts: (1) a description of the geographic distribution of low-income and minority populations in the affected area is undertaken; (2) an assessment is conducted to determine whether construction and operation would produce impacts that are high and adverse; and (3) if impacts are high and adverse, a determination is made as to whether these impacts disproportionately affect minority and low-income populations.

Construction and operation of solar energy projects in the proposed Iron Mountain SEZ could affect environmental justice if any adverse health and environmental impacts resulting from either phase of development are significantly high and if these impacts disproportionately affect minority and low-income populations. If the analysis determines that health and environmental impacts are not significant, there can be no disproportionate impacts on minority and low-income populations. In the event impacts are significant, disproportionality would be determined by comparing the proximity of any high and adverse impacts with the location of low-income and minority populations.

The analysis of environmental justice issues associated with the development of solar facilities considered impacts within the SEZ and an associated 50-mi (80-km) radius around the boundary of the SEZ. A description of the geographic distribution of minority and low-income groups in the affected area was based on demographic data from the 2000 Census (U.S. Bureau of the Census 2009k,l). The following definitions were used to define minority and low-income population groups:

- **Minority.** Persons who identify themselves as belonging to any of the following racial groups: (1) Hispanic, (2) Black (not of Hispanic origin) or African American, (3) American Indian or Alaska Native, (4) Asian, or (5) Native Hawaiian or Other Pacific Islander.

  Beginning with the 2000 Census, where appropriate, the census form allows individuals to designate multiple population group categories to reflect their ethnic or racial origin. In addition, persons who classify themselves as being of multiple racial origin may choose up to six racial groups as the basis of their racial origins. The term minority includes all persons, including those classifying themselves in multiple racial categories, except those who classify themselves as not of Hispanic origin and as White or “Other Race” (U.S. Bureau of the Census 2009k).

The CEQ guidance proposed that minority populations should be identified where either (1) the minority population of the affected area exceeds 50% or (2) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis.

This PEIS applies both criteria in using the Census data for census block groups, wherein consideration is given to the minority population that is both greater than 50% and 20 percentage points higher than in the state (the reference geographic unit).

- **Low-Income.** Individuals who fall below the poverty line. The poverty line takes into account family size and age of individuals in the family. In 1999, for example, the poverty line for a family of five with three children below the age of 18 was $19,882. For any given family below the poverty line, all family members are considered as being below the poverty line for the purposes of analysis (U.S. Bureau of the Census 2009l).

The data in Table 9.2.20.1-1 show the minority and low-income composition of the total population located in the proposed SEZ based on 2000 Census data and CEQ guidelines. Individuals identifying themselves as Hispanic or Latino are included in the table as a separate entry. However, because Hispanics can be of any race, this number also includes individuals identifying themselves as being part of one or more of the population groups listed in the table.

A large number of minority and low-income individuals are located in the 50-mi (80-km) area around the boundary of the SEZ. Within the 50-mi (80-km) radius in California, 47.4% of the population is classified as minority, while 20.7% is classified as low-income. However, the number of minority individuals does not exceed 50% of the total population in the area, and the number of minority individuals exceeds the state average by 20 percentage points or more; thus, there is no minority population in the proposed SEZ area based on 2000 Census data and CEQ guidelines. The number of low-income individuals does not exceed the state average by 20 percentage points or more and does not exceed 50% of the total population in the area; thus, there are no low-income populations in the SEZ.

In the Arizona portion of the 50-mi (80-km) radius, 18.2% of the population is classified as minority, while 12.6% is classified as low-income. The number of minority individuals does not exceed 50% of the total population in the area and the number of minority individuals does not exceed the state average by 20 percentage points or more; thus, there is no minority population in the SEZ area based on 2000 Census data and CEQ guidelines. The number of low-income individuals does not exceed the state average by 20 percentage points or more and does

TABLE 9.2.20.1-1 Minority and Low-Income Populations within the 50-mi (80-km) Radius Surrounding the Proposed Iron Mountain SEZ

Parameter	Arizona	California
Total population	72,101	58,237
White, non-Hispanic	58,957	30,643
Hispanic or Latino	8,621	17,536
Non-Hispanic or Latino minorities	4,523	10,058
One race	3,617	8,535
Black or African American	314	5,935
American Indian or Alaskan Native	2,853	956
Asian	363	1,176
Native Hawaiian or Other Pacific Islander	48	255
Some other race	39	213
Two or more races	906	1,523
Total minority	13,144	27,594
Low-income	8,973	8,213
Percentage minority	18.2	47.4
State percentage minority	24.5	40.5
Percentage low-income	12.6	20.7
State percentage low-income	13.9	14.2

Source: U.S Bureau of the Census (2009k,l).

not exceed 50% of the total population in the area; thus, there are no low-income populations in the SEZ.

Figures 9.2.20.1-1 and 9.2.20.1-2 show the locations of the minority and low-income population groups, respectively, within the 50-mi (80-km) radius around the boundary of the SEZ.

In the California portion of the 50-mi (80-km) radius around the SEZ, more than 50% of the population is classified as minority in block groups located in the city of Blythe itself, to the immediate west and southwest of the city, and in the Fort Mohave Indian Reservation, to the south of Bullhead City. Block groups with a minority population, which is more than 20 percentage points higher than the state average, are located in the city of Blythe, to the immediate west of the city, and in the western and northeastern portions of the 50-mi (80-km) radius. In the Arizona portion of the 50-mi (80-km) radius, more than 50% of the population is

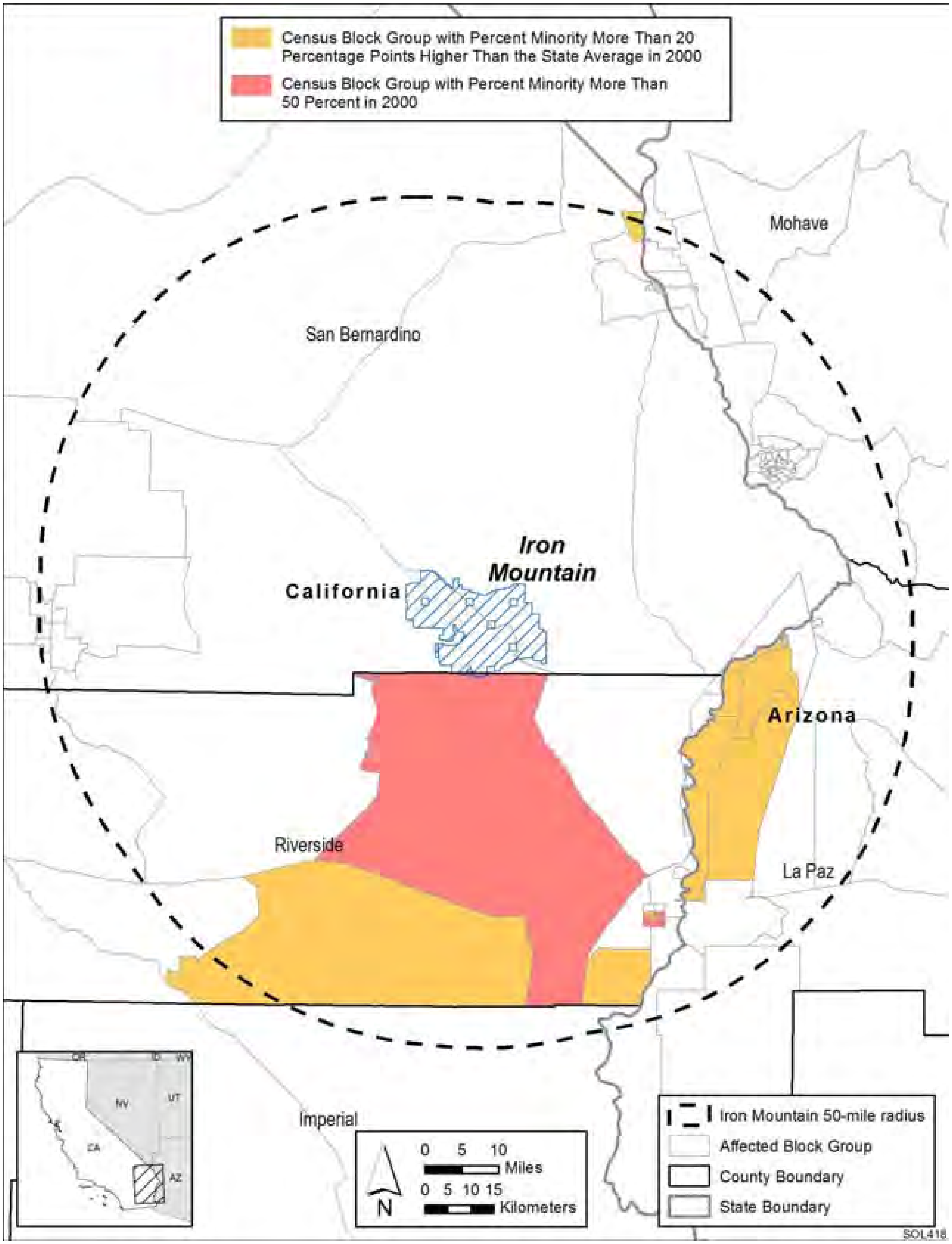

FIGURE 9.2.20.1-1 Minority Population Groups within the 50-mi (80-km) Radius Surrounding the Proposed Iron Mountain SEZ

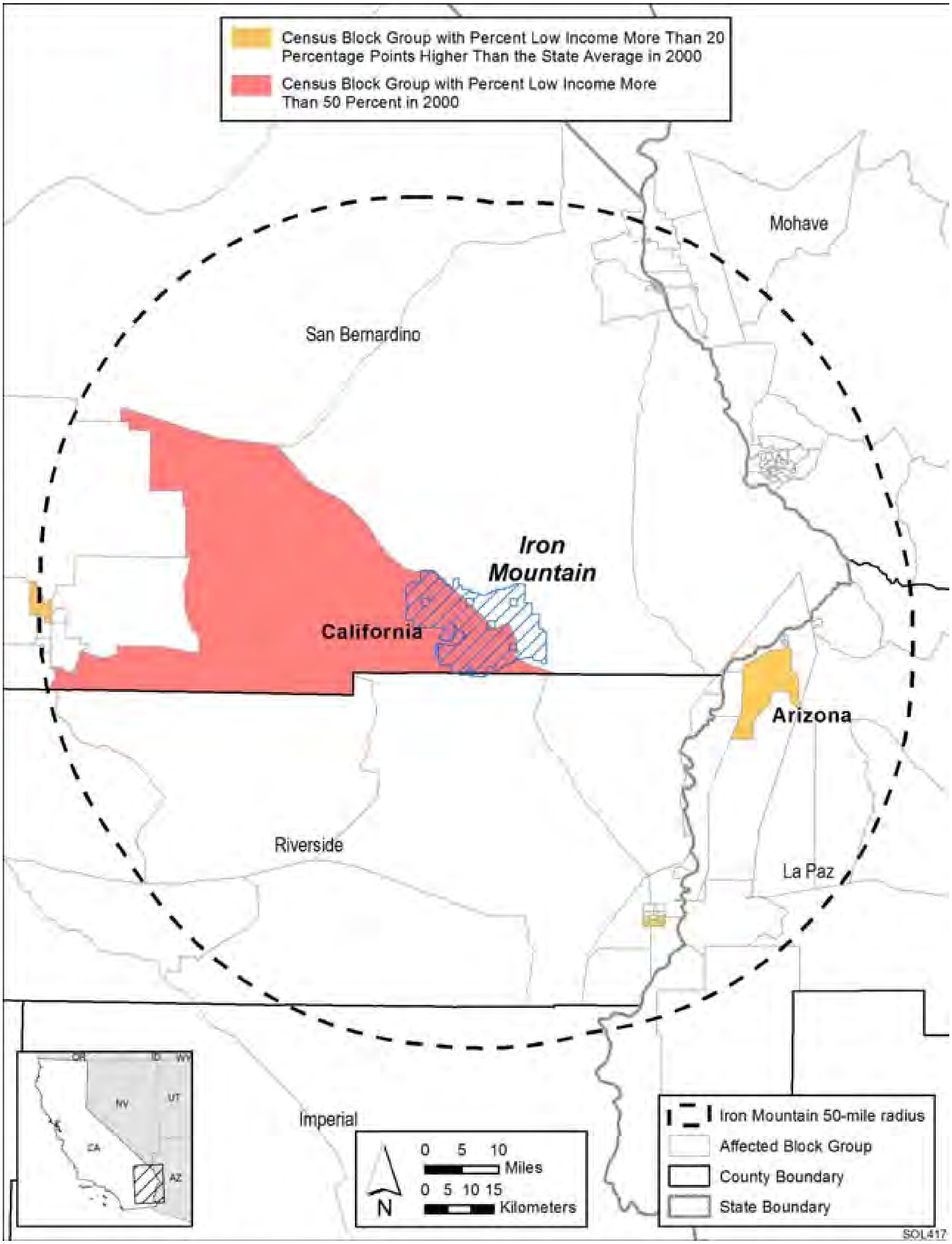

FIGURE 9.2.20.1-2 Low-Income Population Groups within the 50-mi (80-km) Radius Surrounding the Proposed Iron Mountain SEZ

classified as minority in block groups located in the Colorado River Indian Reservation, in the city of Parker, and to the east of the Colorado River, south of Blythe.

Low-income populations in the 50-mi (80-km) radius are limited to two block groups in California, in the city of Blythe and in the city of Twentynine Palms, and one in Arizona, in the Colorado River Indian Reservation. There is one block group in California where the low-income population is more than 20 percentage points higher than the state average, located to the west of the SEZ.

9.2.20.2 Impacts

Environmental justice concerns common to all utility-scale solar energy facilities are described in detail in Section 5.18. These impacts will be minimized through the implementation of the programmatic design features described in Appendix A, Section A.2.2, which address the underlying environmental impacts contributing to the concerns. The potentially relevant environmental impacts associated with solar facilities within the proposed Iron Mountain SEZ include noise and dust during the construction; noise and EMF effects associated with operations; visual impacts of solar generation and auxiliary facilities, including transmission lines; access to land used for economic, cultural, or religious purposes; and effects on property values as areas of concern that might potentially affect minority and low-income populations. Minority populations have been identified within 50 mi (80 km) of the proposed Iron Mountain SEZ; no low-income populations are present (Section 9.2.20.1).

Potential impacts on low-income and minority populations could be incurred as a result of the construction and operation of solar facilities involving each of the four technologies. Although impacts are likely to be small, there are minority populations defined by CEQ guidelines (Section 9.2.20.1) within the 50-mi (80-km) radius around the boundary of the SEZ; this means that any adverse impacts of solar projects could disproportionately affect minority populations. Because there are also low-income populations within the 50-mi (80-km) radius, there could also be impacts on low-income populations.

9.2.20.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features addressing environmental justice impacts have been identified for the proposed Iron Mountain SEZ. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM’s Solar Energy Program, would reduce the potential for environmental justice impacts during all project phases.

9.2.21 Transportation

The proposed Iron Mountain SEZ is accessible by road and rail. One state highway and one railroad pass through the SEZ. A small municipal airport is located 55 mi (88 km) west of the SEZ. General transportation considerations and impacts are discussed in Sections 3.4 and 5.19, respectively.

9.2.21.1 Affected Environment

State Route 62, a two-lane highway, passes through the southern edge of the Iron Mountain SEZ, as shown in Figure 9.2.21.1-1. The town of Twentynine Palms is located about 60 mi (97 km) to the west of the SEZ along State Route 62. Parker, Arizona, is 40 mi (65 km) to the east along State Route 62. Major cities such as Los Angeles to the west and Phoenix to the southeast are about a 355-km (220-mi) drive via I-10, which runs east–west approximately 31 mi (50 km) south of the Iron Mountain SEZ. Several local dirt roads cross the SEZ. Annual average traffic volumes along State Route 62 for 2008 are provided in Table 9.2.21.1-1. Figure 9.2.21-1 also shows the designated open OHV routes in the proposed Iron Mountain SEZ; these routes were designated under the CDCA Plan (BLM 1999).

The ARZC Railroad serves the area (RailAmerica 2008). This regional railroad originates in Cadiz, approximately 25 mi (40 km) to the northwest, where it has an interchange with the Burlington Northern Santa Fe (BNSF) Railroad. As shown in Figure 9.2.21.1-1, the ARZC railroad traverses the Iron Mountain SEZ from the northwest to the southeast. A dirt road, Cadiz Road, runs along parallel to the railroad from Cadiz to State Route 62. The railroad continues on for about 150 mi (240 km), passing through Parker, Arizona, eventually joining with the BNSF Railroad again in Matthie, Arizona, northwest of Phoenix. The ARZC railroad has local stops in Milligan, Sablon, and Freda, which are located at the northwest edge, near the center, and at the southeast edge, respectively, of the SEZ.

Five small public airports are within a driving distance of approximately 85 mi (137 km) of the Iron Mountain SEZ as listed in Table 9.2.21.1-1. The nearest public airport, which is suitable only for light aircraft, is the Twentynine Palms Airport, approximately 55 mi (88 km) to the west of the SEZ along State Route 62 in the town of Twentynine Palms. None of the five airports nearest has scheduled passenger service. The only commercial freight service occurs at Lake Havasu City Municipal Airport in Arizona. In 2009, the amount of commercial freight shipped from and received at the Lake Havasu Airport was 798,744 lb (362,200 kg) and 884,488 lb (401,100 kg), respectively (BTS 2009).

9.2.21.2 Impacts

As discussed in Section 5.19, the primary transportation impacts are anticipated to be from commuting worker traffic. State Route 62 provides a regional traffic corridor that could experience moderate impacts for single projects that may have up to 1,000 daily workers, with an additional 2,000 vehicle trips per day (maximum). This would represent up to approximately

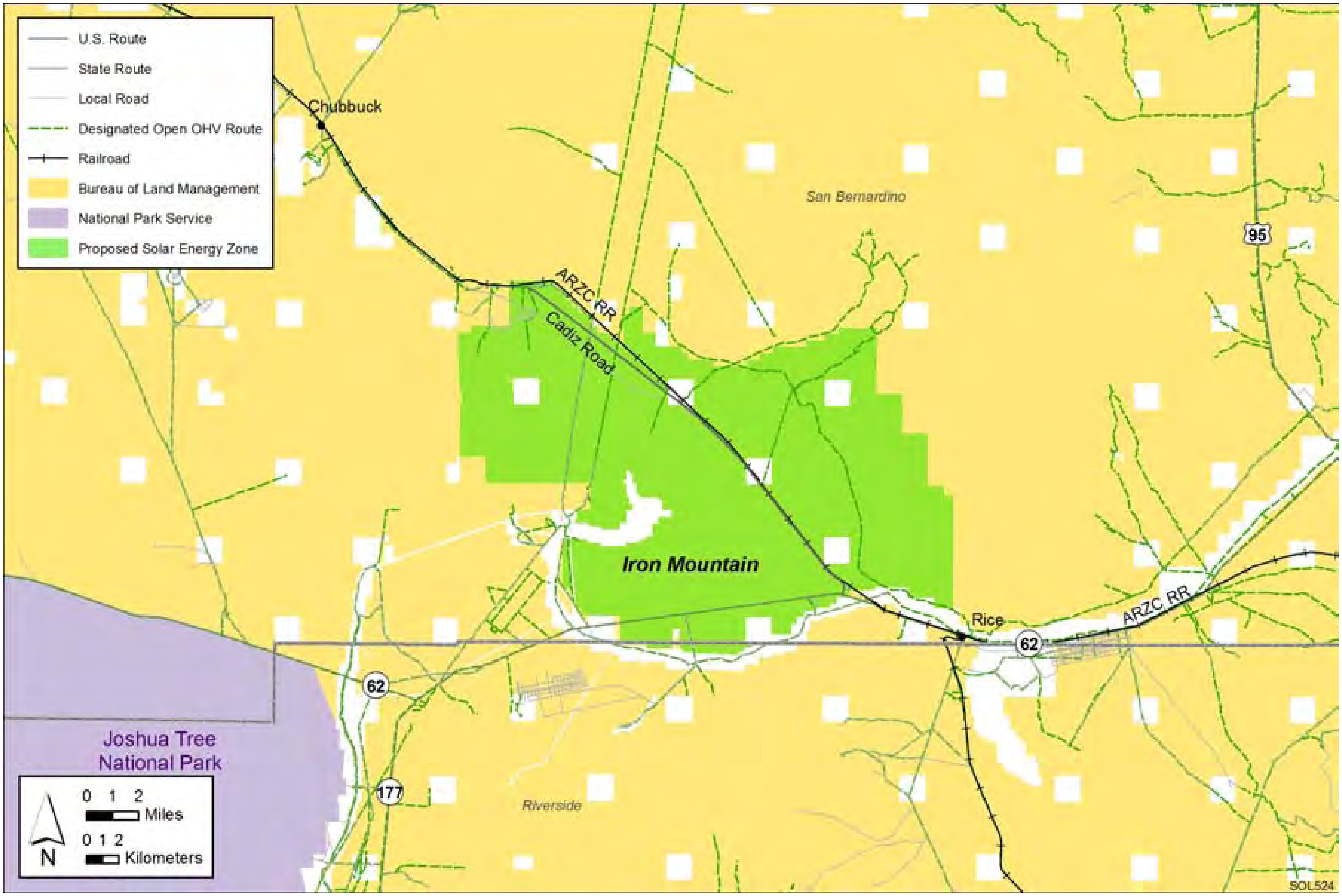

FIGURE 9.2.21.1-1 Local Transportation Network Serving the Proposed Iron Mountain SEZ

TABLE 9.2.21.1-1 AADT on Major Roads near the Proposed Iron Mountain SEZ, 2008

Road	General Direction	Location	AADT (Vehicles)
State Route 62	East–west	Junction I-10	19,000
		Junction State Route 247	28,500
		Park Boulevard (in Joshua Tree)	18,000
		Utah Trail (in Twentynine Palms)	2,700
		San Bernardino/Riverside County Line	500
		Junction State Route 177	2,200
		Cadiz Road	2,000
		Blythe Rice Road	2,000
		Junction U.S. 95	2,700
U.S. 95	North–south	Junction State Route 62	3,000

Source: Caltrans (2009).

two times the AADT values summarized in Table 9.2.21.1-2 for State Route 62 in the vicinity of the SEZ. Local road improvements would be necessary in any portion of the SEZ along State Route 62 that might be developed in order not to overwhelm the local roads near any site access point(s).

Solar development within the SEZ would affect public access along OHV routes designated open and available for public use. Although few routes within the proposed SEZ are designated as open, open routes crossing areas granted ROWs for solar facilities would be redesignated as closed (see Section 5.5.1 for more details on how routes coinciding with proposed solar facilities would be treated).

Should up to three large projects with approximately 1,000 daily workers each be under development simultaneously, an additional 6,000 vehicle trips per day could be added to State Route 62 in the vicinity of the SEZ, assuming ride-sharing was not implemented. This increase in traffic would quadruple the current average daily traffic level on State Route 62 and could have serious impacts on traffic flow during peak commute times. The extent of the problem would depend on the relative locations of the projects within the SEZ, where the worker populations originate, and the work schedules. Road improvements in the vicinity of any project within the SEZ could include deceleration and acceleration lanes on State Route 62 at project access points to help maintain flow along the highway as well as other design features listed in the following for individual projects.

1

TABLE 9.2.21.1-2 Airports Open to the Public in the Vicinity of the Iron Mountain SEZ

			Runway 1[a]			Runway 2[a]		
Airport	Location	Owner/Operator	Length [ft (m)]	Type	Condition	Length [ft (m)]	Type	Condition
Avi Suquilla	Just across the border in Parker, AZ, approximately 40 mi (64 km) east of the SEZ	Colorado River Indian Tribes	6,250 (1,905)	Asphalt	Good	–[b]	–	–
Blythe Municipal	Off I-10, about 75 mi (120 km) south of the SEZ	County of Riverside/ City of Blythe	5,800 (1,768)	Asphalt	Good	6,543 (1,994)	Asphalt	Good
Lake Havasu City Municipal	Off AZ State Route 95, about 85 mi (137 km) from the SEZ to the northeast	Lake Havasu City	8,001 (2,439)	Asphalt	Good	–	–	–
Needles	About 68 mi (109 km) to the north-northeast of the SEZ on U.S. 95	County of San Bernardino	4,235 (1,291)	Asphalt	Fair	5,005 (1,526)	Asphalt	Good
Twentynine Palms	Approximately 55 mi (88 km) to the west of the SEZ along State Route 62	County of San Bernardino	3,797 (1,157)	Asphalt	Good	5,531 (1,686)	Asphalt	Good

[a] Source: FAA (2009).

[b] A dash indicates not applicable.

9.2.21.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features have been identified related to impacts on transportation systems around the Iron Mountain SEZ. The programmatic design features discussed in Appendix A, Section A.2.2, including local road improvements, multiple site access locations, staggered work schedules, and ride-sharing, would all provide some relief to traffic congestion on local roads leading to any project site. Depending on the location of a proposed solar facility within the SEZ, more specific access locations and local road improvements would be implemented.

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9.2.22 Cumulative Impacts

The analysis presented in this section addresses the potential cumulative impacts in the vicinity of the proposed Iron Mountain SEZ in San Bernardino County, California. The CEQ guidelines for implementing NEPA define cumulative impacts as environmental impacts resulting from the incremental impacts of an action when added to other past, present, and reasonably foreseeable future actions (40 CFR 1508.7). The impacts of other actions are considered without regard to the agency (federal or nonfederal), organization, or person that undertakes them. The time frame of this cumulative impacts assessment could appropriately include activities that would occur up to 20 years in the future (the general time frame for PEIS analyses), but little or no information is available for projects that could occur further than 5 to 10 years in the future.

The nearest population center is the small community of Rice, located near the southeast boundary of the SEZ. The proposed Iron Mountain SEZ is in the center of an area of high wilderness and scenic value. Within 25 mi (40 km) of the area, 11 WAs, including 1 within a national park, are visible from the SEZ. The Turtle Mountain ACEC, which was designated for its outstanding scenic resources, is included within the boundary of the Turtle Mountains Wilderness. In addition, the Iron Mountain SEZ is close to the Riverside East SEZ, and in some areas, impacts from the two SEZs overlap. The geographic extent of the cumulative impacts analysis for potentially affected resources near the Iron Mountain SEZ is identified in Section 9.2.22.1. An overview of ongoing and reasonably foreseeable future actions is presented in Section 9.2.22.2. General trends in population growth, energy demand, water availability, and climate change are discussed in Section 9.2.22.3. Cumulative impacts for each resource area are discussed in Section 9.2.22.4.

9.2.22.1 Geographic Extent of the Cumulative Impacts Analysis

The geographic extent of the cumulative impacts analysis for potentially affected resources evaluated near the Iron Mountain SEZ is provided in Table 9.2.22.1-1. These geographic areas define the boundaries encompassing potentially affected resources. Their extent varies on the basis of the nature of the resource being evaluated and the distance at which an impact may occur (thus, for example, the evaluation of air quality may have a greater regional extent of impact than that of visual resources). Most of the lands around the SEZ are administered by the BLM, the NPS, or the DoD; there are also some Tribal Lands about 20 mi (30 km) east and southeast of the SEZ. The BLM administers approximately 72% of the lands within a 50-mi (80-km) radius of the SEZ.

9.2.22.2 Overview of Ongoing and Reasonably Foreseeable Future Actions

The future actions described below are those that are "reasonably foreseeable"; that is, they have already occurred, are ongoing, are funded for future implementation, or are included in firm near-term plans. Types of proposals with firm near-term plans are as follows:

TABLE 9.2.22.1-1 Geographic Extent of the Cumulative Impacts Analysis by Resource Area: Proposed Iron Mountain SEZ

Resource Area	Geographic Extent
Lands and Realty	Eastern San Bernardino County—Ward Valley
Specially Designated Areas and Lands with Wilderness Characteristics	Within a 25-mi (40-km) radius of the Iron Mountain SEZ
Rangeland Resources	Eastern San Bernardino and Riverside Counties
Recreation	All of San Bernardino and Riverside Counties
Military and Civilian Aviation	For Military Aviation, southeastern California and western Arizona. For Civilian Aviation, eastern San Bernardino and Riverside Counties
Soil Resources	Areas within and adjacent to the Iron Mountain SEZ
Minerals	Eastern San Bernardino and Riverside Counties
Water Resources	
Surface Water	CRA, Danby Lake, Homer Wash
Groundwater	Ward Valley and Rice Valley Basins
Air Quality and Climate	A 31-mi (50-km) radius from the center of the Iron Mountain SEZ within the Mojave Desert Air Basin
Vegetation, Wildlife and Aquatic Biota, Special Status Species	A 50-mi (80-km) radius from the center of the Iron Mountain SEZ, including portions of San Bernardino, Riverside, and Imperial Counties in California, and La Paz and Mohave Counties in Arizona
Visual Resources	Viewshed within a 25-mi (40-km) radius of the Iron Mountain SEZ
Acoustic Environment (noise)	Areas adjacent to the Iron Mountain SEZ
Paleontological Resources	Areas within and adjacent to the Iron Mountain SEZ
Cultural Resources	Areas within and adjacent to the Iron Mountain SEZ for archaeological sites; viewshed within a 25-mi (40-km) radius of the SEZ for other properties, such as traditional cultural properties.
Native American Concerns	Ward Valley and surrounding mountains; viewshed within a 25-mi (40-km) radius of the Iron Mountain SEZ
Socioeconomics	A 50-mi (80-km) radius from the center of the Iron Mountain SEZ
Environmental Justice	A 50-mi (80-km) radius from the center of the Iron Mountain SEZ
Transportation	U.S. Highway 95; State Routes 62, 177

- Proposals for which NEPA documents are in preparation or finalized;

- Proposals in a detailed design phase;

- Proposals listed in formal NOIs published in the *Federal Register* or state publications;

- Proposals for which enabling legislations has been passed; and

- Proposals that have been submitted to federal, state, or county regulators to begin a permitting process.

Projects in the bidding or research phase or that have been put on hold were not included in the cumulative impact analysis.

The ongoing and reasonably foreseeable future actions described below are grouped into two categories: (1) actions that relate to energy production and distribution, including potential solar energy projects under the proposed action (Section 9.2.22.2.1), and (2) other ongoing and reasonably foreseeable actions, including those related to mining and mineral processing, grazing management, transportation, recreation, water management, and conservation (Section 9.2.22.2.2). (Table 9.2.22.2-1 lists reasonably foreseeable future actions related to the “energy” and “other major actions” categories within a 50-mi [80-km] radius from the center of the Iron Mountain SEZ.) Together, these actions have the potential to affect human and environmental receptors within the geographic range of potential impacts over the next 20 years.

9.2.22.2.1 Energy Production and Distribution

Reasonably foreseeable future actions related to energy production and distribution within 50 mi (80 km) of the center of the Iron Mountain SEZ are described in the following sections. That area includes portions of San Bernardino, Riverside, and Imperial Counties in California, and La Paz and Mohave Counties in Arizona. Future renewable energy facilities are expected to be the main contributors to potential future impacts in this area, because of favorable conditions in the area for their development, large acreages required, and potentially large quantities of water used. The area is otherwise largely undeveloped and would be expected to remain so in the absence of renewable energy development. Thus, this analysis focuses on renewable energy facilities and any other foreseeable large energy projects nominally covering 500 acres (2 km^2) or more or requiring amounts of water on the scale of utility-scale CSP. Figure 9.2.22.2-1 shows the approximate locations of the key projects.

Renewable Energy Development

Several recent executive and legislative actions in California have addressed renewable energy development within the state. In November 2008, Governor Schwarzenegger signed

TABLE 9.2.22.2-1 Reasonably Foreseeable Future Actions Related to Energy Development and Distribution and Other Major Actions near the Proposed Iron Mountain SEZ[a]

Description	Status	Resources Affected	Primary Impact Location
Renewable Energy Project on Private Land			
Rice Solar Energy, 150-MW power tower facility; 2,560 total acres	In review; AFC[b] filed with CEC Oct. 21, 2009; CEC comments on AFC sent Nov. 23, 2009.	Land use, visual, terrestrial habitats, wildlife, groundwater	Southeast of Iron Mountain SEZ adjacent to and south of State Route 62
Fast-Track Solar Energy Projects on BLM-Administered Land			
First Solar Desert Sunlight (CACA-48649), 550-MW PV facility; 4,410 disturbed acres	NOI to prepare an EIS issued Jan 13, 2010	Land use, visual, terrestrial habitats, wildlife, groundwater	Western part of Riverside East SEZ
Solar Millennium Palen Solar Project (CACA 48810), 484-MW solar trough; 5,200 total acres	NOI to prepare an EIS issued Nov. 23, 2009	Land use, visual, terrestrial habitats, wildlife, groundwater	West-central part of Riverside East SEZ
Solar Millennium Blythe Solar Project (CACA 48811), 986-MW trough facility; 9,480 total acres[c]	NOI to prepare an EIS issued Nov. 23, 2009	Land use, visual, terrestrial habitats, wildlife, groundwater	Eastern part of Riverside East SEZ
NextEra Genesis Ford Dry Lake Solar Project (CACA-4880); 250 MW trough facility; 4,640 total acres[c]	NOI to prepare an EIS issued Nov. 23, 2009	Land use, visual, terrestrial habitats, wildlife, groundwater	Central part of Riverside East SEZ
Other Projects			
Cadiz Valley Dry Year Supply Project	Under review	Disturbed areas, terrestrial habitats along railroad ROW	Areas adjacent to ARZC Railroad ROW in southern portion of the Iron Mountain SEZ
Proposed West Chocolate Mountains Renewable Energy Evaluation Area	NOI to prepare an EIS issued Feb. 10, 2010	Land use, visual, terrestrial habitats, wildlife, groundwater	About 40 mi south of the Iron Mountain SEZ

[a] Projects in later stages of agency environmental review and project development.

[b] AFC = application for certification.

[c] Project approved. Updated information will be included in the Final EIS. See http://www.blm.gov/wo/st/en/prog/energy/renewable_energy/fast-track_renewable.html for details

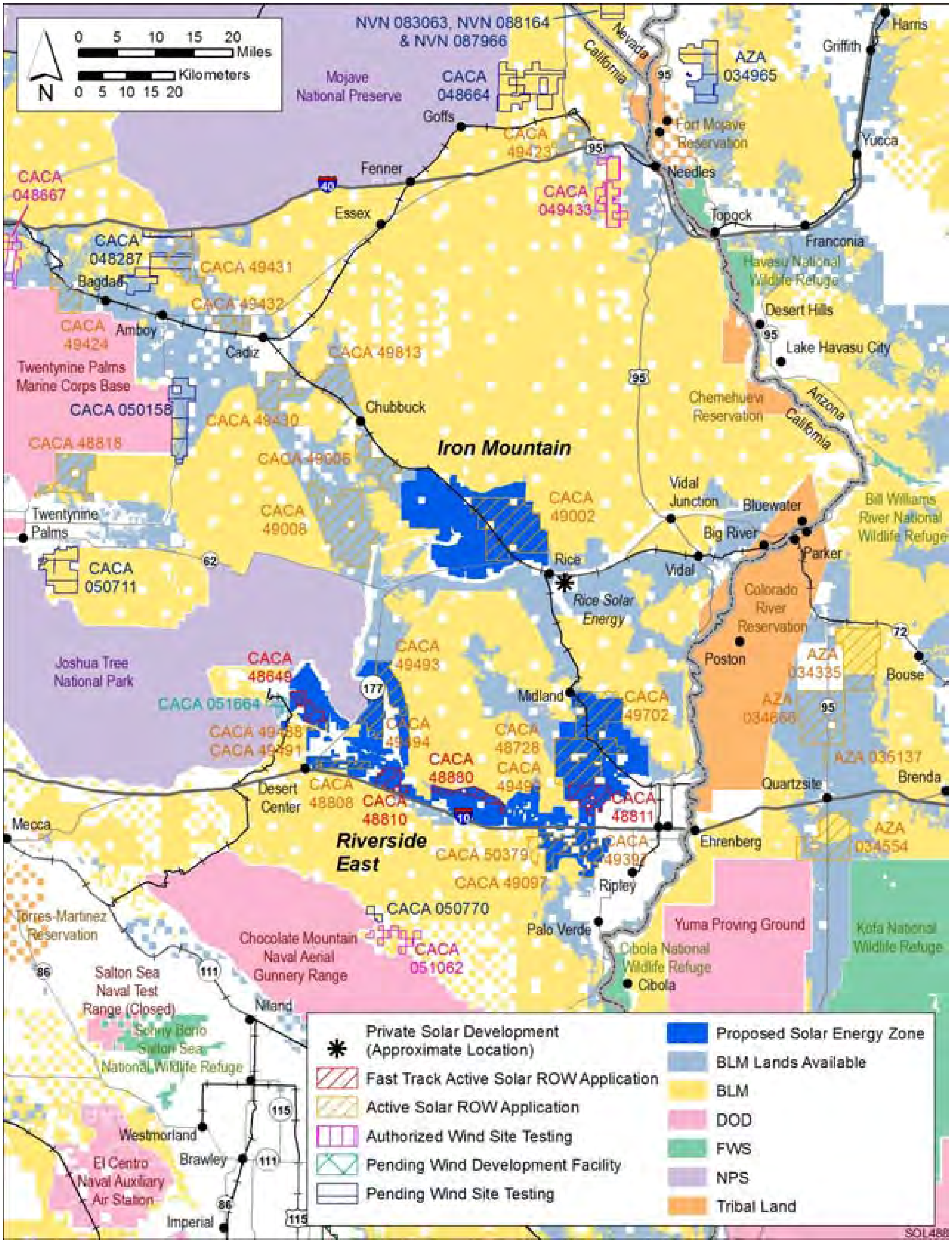

FIGURE 9.2.22.2-1 Locations of Renewable Energy Proposals on Public Land within a 50-mi (80-km) Radius of the Proposed Iron Mountain SEZ

E.O. S-14-08 to streamline California's renewable energy project approval process and increase the state's RPS to the most aggressive in the nation—at 33% renewable power by 2020. On September 15, 2009, the governor issued a second E.O., now requiring that 33% of all electrical energy produced in the state be from renewable energy sources by the year 2020. The E.O. directed the CARB to adopt regulations increasing California's RPS to 33% by 2020.

In 2009, the California Legislature drafted bills requiring that electrical energy production meet a standard of 33% from renewable sources. On October 12, 2009, Governor Schwarzenegger vetoed two bills from the California Legislature on electrical energy generated by renewable sources in favor of an alternative plan that would remove limits on the amount of renewable power utilities could buy from other states (African American Environmentalist Association 2009).

Solar Energy. Table 9.2.22.2-1 lists one project on private land, Rice Solar Energy, and four foreseeable solar energy projects on public land, the so-called fast-track projects. Fast-track projects are those on public lands for which the environmental review and public participation process is under way and the ROW applications could be approved by December 2010 (BLM 2010a). The listed Rice and fast-track projects are considered foreseeable because the permitting and environmental review processes are under way. The locations of these five projects are shown on Figure 9.2.22.2-1. Other, more numerous, pending regular-track ROW applications shown in the figure are discussed collectively at the end of this section.

- *Rice Solar Energy.* The proposed Rice Solar Energy Project would be a power tower facility with an output of 150 MW constructed on 1,410 acres (6 km^2) of a 2,560-acre (10-km^2) parcel on privately owned land in unincorporated eastern Riverside County, California (CEC 2009). Access to the site would be from State Route 62 just north of the site. The Iron Mountain SEZ is less than 5 mi (8 km) northwest of the site, and the eastern portion of the Riverside East SEZ is about 15 mi (24 km) south. Land surrounding the project site consists mostly of undeveloped open desert owned by the Federal Government and managed by the BLM.

  The facility would employ a liquid salt heat transfer and storage medium and a conventional steam turbine. Propane would be used for auxiliary heating, and no natural gas pipeline to the facility would be needed. The facility would use an air-cooled condenser (dry cooling). Water use during the proposed 2011 to 2013 (30-month) construction period would be 780 ac-ft/yr (0.96 million m^3/yr). Process water requirements for facility operations, commencing by the end of 2013, are estimated to be up to 180 ac-ft/yr (0.22 million m^3/yr), assuming an operating capacity factor of 37%. A mostly local construction workforce (averaging 280 workers) would be used. Operations and maintenance of the facility would employ an estimated 47 workers (CEC 2009).

Surveys found seven desert tortoises, along with shell-skeletal remains, burrows, egg shell fragments, and scat present on the project site, along the generator tie-line route, and within the 1-mi (1.6-km) wide zone surrounding the project site. In addition, western burrowing owl, Mojave fringe-toed lizard, and loggerhead shrike were found to be present in or near the project area. Several California-listed sensitive plant species were found on the project site or along the proposed transmission line ROW (CEC 2009).

- *First Solar Desert Sunlight (CACA 48649).* This proposed fast-track project would use a thin-film PV technology in a facility with an output of 550 MW. The proposed project site is located on approximately 9,480 acres (38.4 km^2) and would disturb up to 4,400 acres (17.8 km^2) of public land in Riverside County, California, approximately 6 mi (10 km) north of the community of Desert Center, California, and about 7 mi (11 km) north of the I-10 transmission corridor (BLM 2010b). The facility and most of the corridor for the project's 230-kV generation interconnection transmission line would be located in the western portion of the proposed Riverside East SEZ, about 25 mi (40 km) from the Iron Mountain SEZ. The project would include the solar facility, an on-site substation, a 230-kV generation interconnection line within the transmission corridor, and a planned 230- to 500-kV Red Bluff substation. The Red Bluff substation would connect the project to the Southern California Edison (SCE) regional transmission grid.

  The proposed PV facility would have an estimated water requirement of 27 ac-ft/yr (33,000 m^3/yr) during its 2011 to 2013 construction period and only 4 ac-ft/yr (5,000 m^3/yr) thereafter for operation (BLM and CEC 2010a). On the basis of estimated employment levels for PV facilities (Section 9.2.19.2.2), construction of the facility would employ about 220 people, while operations would require an estimated 11 full-time employees.

- *Solar Millennium Palen Solar Project (CACA 48810).* This proposed fast-track project is a parabolic trough facility with an output of 484 MW. The project site would be on public land within the western portion of the proposed Riverside East SEZ, approximately 10 mi (16 km) east of Desert Center, California, adjacent to the I-10 transmission corridor. The proposed facility would occupy approximately 3,800 acres (15.4 km^2) within a proposed 5,200-acre (20.9-km^2) ROW. The facility would employ two adjacent and independent solar troughs with nominal output of 250 MW each. It would employ dry cooling and would require about 300 ac-ft/yr (0.37 million m^3/yr) of groundwater drawn from two on-site wells for mirror washing and other uses. Water requirements during the proposed construction period of 2011 to 2013 are estimated to be 480 ac-ft/yr (0.59 million m^3/yr). The project would disturb about 3,000 acres (12 km^2). The facility would connect to the planned Red Bluff substation, to be built approximately 10 mi (16 km) west of the project location. An auxiliary boiler would be fired with propane. An average of 566 workers would be employed during construction, and 134 full-time employees would be required for operations (BLM and CEC 2010a).

Special status species of concern include desert tortoise and burrowing owl. No desert tortoises and only low-quality tortoise habitat were observed during spring 2009 surveys. Cultural surveys have identified both prehistoric and historic cultural resources (BLM and CEC 2010a).

- *Solar Millennium Blythe Solar Project (CACA 48811).* This proposed fast-track project would be a parabolic trough facility with an output of 986 MW. The project would be on public land within the eastern portion of the proposed Riverside East SEZ, approximately 8 mi (13 km) west of Blythe, California, adjacent to the I-10 transmission corridor. The proposed facility would occupy approximately 9,480 acres (38.4 km^2) and disturb about 7,030 acres (28.5 km^2). The facility would employ four adjacent and independent solar troughs with nominal output of 250 MW each. It would employ dry cooling and would require about 600 ac-ft/yr (0.74 million m^3/yr) of groundwater drawn from two on-site wells for mirror washing and other uses. Water requirements during the proposed construction period of 2011 to 2015 are estimated to be 620 ac-ft/yr (0.77 million m^3/yr). The facility would connect to a planned new substation, the Colorado River substation, to be built approximately 5 mi (8 km) southwest of the project location. To supply auxiliary boilers, a 9.8-mi (15.7-km) long natural gas pipeline would be built to connect to an existing pipeline south of I-10; about 8 mi (13 km) of the line would be on the project ROW. An average of 604 workers would be employed during construction of the facility, and 221 full-time employees would be required for operations (BLM and CEC 2010b).

  Project construction would result in a direct loss of low- to moderate-quality habitat for desert tortoise over the project site and would fragment and degrade adjacent native plant and wildlife communities. The project could also promote the spread of invasive non-native plants and desert tortoise predators such as ravens. Five species of California-listed sensitive plant species are present. Habitat for western burrowing owl, loggerhead shrike, Le Conte's thrasher, black-tailed gnatcatcher, and California horned lark is also present (BLM and CEC 2010b).

- *NextEra Genesis Ford Dry Lake Solar Project (CACA 4880).* This proposed fast-track project consists of two independent solar trough facilities using wet cooling with a total output of 250 MW. The project would be located on public land within the central portion of the proposed Riverside East SEZ, approximately 20 mi (32 km) west of Blythe, California, north of I-10 and near Dry Lake, California. The proposed facility would occupy 4,640 acres (18.8 km^2) and directly affect 1,800 acres (7.3 km^2). The proposed facility would employ wet cooling and would require about 1,640 ac-ft/yr

(2.0 million m^3/yr) of cooling water from on-site wells. Water requirements during the proposed construction period of 2011 to 2013 are estimated to be 870 ac-ft/yr (1.1 million m^3/yr). The facility would connect to the proposed Colorado River substation via a 230-kV on-site switchyard and a new transmission line that would tie into the existing Blythe Energy Project transmission line. The new transmission line, natural gas line, and access road would be built in the same corridor that would exit the southern site boundary and extend about 6.5 mi (10.5 km) south. An average of 646 workers would be employed during construction of the facility, and 40 to 50 full-time employees would be required for operations (BLM and CEC 2010c).

Biological surveys have identified a number of special status species, including Mojave and Colorado fringe-toed lizards, loggerhead shrike, Western burrowing owl, short-eared owl, prairie falcon, and northern harrier. While no live desert tortoise were found, burrows and bones were present on the site and tracks and carcasses in the surrounding area. As many as 15 cultural resource sites would be directly affected by construction of the proposed Genesis Solar Energy Project (BLM and CEC 2010c).

- *Pending Solar ROW Applications on BLM-Administered Lands.* In addition to the four fast-track solar projects described above, a number of regular-track ROW applications for solar projects have been submitted to the BLM that would be located either within the Iron Mountain SEZ or within 50 mi (80 km) of the SEZ (BLM and USFS 2010b). Table 9.2.22.2-2 lists all solar projects that had pending applications submitted to the BLM as of March 2010. Figure 9.2.22.2-1 shows the locations of these applications.

  Of the 25 active solar applications listed in Table 9.2.22.2-2, one application is within the Iron Mountain SEZ, CACA 49002, on the eastern half of the SEZ. Two applications are within 5 mi (8 km) of the boundary—CACA 49006, 1 mi (1.6 km) west and extending to about 6 mi (9.6 km) north of the SEZ, and CACA 49008, 4 mi (6.5 km) west of the west-central portion of the SEZ. All these applications, which are administered through the Needles Field Office, are listed in Table 9.2.22.2-2 and shown in Figure 9.2.22.2-1.

  The likelihood of any of the regular-track ROW application projects actually being developed is uncertain, but is generally assumed to be less than that for fast-track applications. The projects are all listed for completeness and as an indication of the level of interest in development of solar energy in the region. Some number of these applications would be expected to result in actual projects. Thus, the cumulative impacts of these potential projects are analyzed in their aggregate effects.

Wind Energy. Table 9.2.22.2-2 lists ROW grant applications for five pending wind site testing, three authorized for wind site testing, and one pending wind development facility within

TABLE 9.2.22.2-2 Pending Renewable Energy Project ROW Applications on BLM-Administered Land within 50 mi (80 km) of the Proposed Iron Mountain SEZ[a]

Serial No.	Project Name	Application Received	Size (acres[b])	MW	Technology	Field Office
Solar Applications						
AZA 034335	Boulevand Associates, LLC	June 8, 2007	24,221	500	CSP/Trough	Lake Havasu: Yuma
AZA 034554	Nextlight Renewable Power, LLC	March 26, 2008	20,699	500	CSP/Trough	Yuma
AZA 034666	SolarReserve, LLC (Quartzsite)	May 27, 2008	25,204	100	CSP/Tower	Yuma
AZA 035137	E-on Climate & Renewables (Castle Dome)	July 2, 2009	590	100	PV	Yuma
CACA 48728	FPL Energy	Jan. 31, 2007	20,608	250	CSP	Palm Springs-Southcoast
CACA 48808	Chuckwalla Solar, LLC	Sept. 15, 2006	4,099	200	PV	Palm Springs-Southcoast
CACA 48818	First Solar (Desert Opal)	Feb. 26, 2007	15,824	1,205	PV	Barstow
CACA 49002	Leopold Company, LLC	Apr. 2, 2007	35,466	4,100	CSP	Needles
CACA 49006	Boulevard Associates, LLC	May 14, 2007	12,046	1,000	CSP	Needles
CACA 49008	Boulevard Associates, LLC	May 14, 2007	35,639	1,000	CSP	Needles
CACA 49097	Bull Frog Green Energy, LLC	Oct. 1, 2008	6,634	2,500	PV	Palm Springs-Southcoast
CACA 49397	First Solar (Desert Quartzite)	Oct. 28, 2007	7,548	600	PV	Palm Springs-Southcoast
CACA 49423	Solel, Inc.	July 23, 2007	6,614	0		Needles
CACA 49424	Solel, Inc.	July 23, 2007	7,453	600	CSP	Needles
CACA 49430	Iberdrola Renewables, Inc.	Dec. 8, 2008	13,373	N/A	CSP	Needles
CACA 49431	Boulevard Associates, LLC	Sept. 21, 2007	10,199	1,000	CSP	Needles
CACA 49432	PG&E	Sept. 24, 2007	5,315	800	Undecided	Needles
CACA 49488	Enxco, Inc.	Nov. 13, 2007	1,327	300	CSP	Palm Springs-Southcoast
CACA 49490	Enxco, Inc.	Nov. 13, 2007	20,608	300	CSP	Palm Springs-Southcoast
CACA 49491	Enxco, Inc.	Nov. 13, 2007	1,327	300	CSP	Palm Springs-Southcoast
CACA 49493	Solel, Inc.	March 27, 2008	8,750	500	CSP	Palm Springs-Southcoast
CACA 49494	Solel, Inc.	Nov. 6, 2007	7,317	500	CSP	Palm Springs-Southcoast
CACA 49702	Bull Frog Green Energy, LLC	June 1, 2008	22,717	2,500	PV	Palm Springs-Southcoast
CACA 49813	Iberdrola Renewables, Inc.	April 1, 2008	12,833	1,000	CSP	Needles
CACA 50379	Lightsource Renewables, LLC	Aug. 8, 2008	2,446	550	CSP	Palm Springs-Southcoast

TABLE 9.2.22.2-2 (Cont.)

Serial No.	Project Name	Application Received	Size (acres[c])	MW	Technology	Field Office
Wind Applications Pending Wind Site Testing						
AZA 34965	Oak Creek Energy Systems, Inc.	–[c]	16,258	–	Wind	Lake Havasu: Kingman
CACA 48287	Renewergy, LLC	July 26, 2006	7,760	–	Wind	Needles
CACA 48664	Renewergy, LLC	Aug. 7, 2006	37,219	–	Wind	Needles
CACA 50711	Padoma Wind Power, LLC	March 17, 2009	23,829	–	Wind	Barstow
CACA 50770	–	–	–	–	Wind	–
Authorized Wind Site Testing		Application Last Authorized				
CACA 48667	Oak Creek Energy	June 16, 2010	23,691	–	Wind	Needles
CACA 49433	Padoma Wind Power, LLC	June 16, 2010	25,832	–	Wind	Needles
CACA 51062	John Deere Renewables, LLC	April 29, 2009	6,256		Wind	El Centro
Pending Wind Development Facility						
CACA 51664	LH Renewable, LLC	Dec. 8, 2009	3,500	–	Wind	Palm Springs

[a] Information taken from pending and authorized wind energy projects listed on BLM California Desert District Web site (BLM 2010e) and downloaded from GeoCommunicator (BLM and USFS 2010b). Total solar acres = 126,168, total solar MW =20,387; total wind acres and MW not available.

[b] To convert acres to km^2, multiply by 0.004047.

[c] A dash indicates data not available.

a 50-mi (80-km) radius of the proposed Iron Mountain SEZ. The actual development of all nine proposals is considered pending, however, since they await authorization of development of wind facilities. As shown in Figure 9.2.22.2-1, the locations of the applications lie generally on an arc running from north to west to south of the SEZ at a distance of approximately 30 mi (48 km).

The likelihood of any of the regular-track wind projects actually being developed is uncertain; the projects are listed to give an indication of the level of interest in development of wind energy in the region. Most are in the wind testing stage, and EAs necessary for project approval are being prepared.

***Geothermal Energy*.** No geothermal applications are located within 50 mi (80 km) of the Iron Mountain SEZ.

9.2.22.2.2 Other Actions

Other Foreseeable Actions

Cadiz Valley Dry-Year Supply Project. The Cadiz Valley Dry-Year Supply Project is a water storage and supply program that will provide southern California with as much as 150,000 ac-ft/yr (185 million m^3/yr) of water during years of droughts, emergencies, or other periods of urgent need by utilizing the aquifer system that underlies Cadiz's 35,000 acres (142 km^2) of land holdings in the Cadiz and Fenner Valleys of eastern San Bernardino County (Cadiz, Inc. 2008). Historically, such dry periods occur about 3 out of every 10 years. In any given dry year, this water would be enough to serve more than 1.2 million people. The project would involve taking water from the CRA during high rainfall years and storing it in aquifer systems to supply southern California's water needs during periods of severe drought.

The project was the subject of congressional hearings in August 2009 regarding Cadiz, Inc.'s controversial proposal to use a 42-mi (68-km) long stretch of a Mojave railway line ROW for the water pipeline (Chance of Rain 2009). A portion of the water pipeline would cross the extreme southern part of the Iron Mountain SEZ.

Proposed West Chocolate Mountains Renewable Energy Evaluation Area. In a February 10, 2010, NOI in the *Federal Register*, the BLM El Centro Field Office announced its intent to prepare an EIS to consider an amendment to the CDCA Plan to identify whether 21,300 acres (86.2 km^2) of BLM-administered lands within the West Chocolate Mountains area should be made available for geothermal, solar, or wind energy development (BLM 2010a). The Evaluation Area lies about 40 mi (64.3 km) south of the proposed Iron Mountain SEZ in Riverside County, east of Niland and northeast of El Centro, California. Cumulative impacts at this distance would affect mainly ecological and socioeconomic resources.

Other Ongoing Actions

Mining. The BLM GeoCommunicator Database (BLM and USFS 2010b) shows there are no mining claims for locatable minerals within the proposed Iron Mountain SEZ. About 23,000 acres (93 km^2) of the SEZ is classified as a KSLA, and there are currently three active leases in the area. Sodium is being produced from the area, and production is expected to continue.

Grazing. One grazing allotment exists in the immediate vicinity of the Iron Mountain SEZ (BLM and USFS 2010b). The Keoughs allotment (serial no. CACA 06001) is located mostly in northern Riverside County and adjacent to the southeastern portion of the SEZ. The next nearest grazing allotment (Lazy Daisy allotment, serial no. CACA 09076) is located about 25 to 30 mi (40 to 48 km) north of the SEZ. There is no grazing within the Iron Mountain SEZ, therefore there would be no cumulative effect on the grazing industry.

Communication Sites. One communication tower (serial no. CACA 014137) is located in the western portion of the Iron Mountain SEZ.

Gas Pipeline. Two natural gas pipelines cross the Iron Mountain SEZ paralleling the Atchison Topeka and Santa Fe Railroad, which runs diagonally through the SEZ from southeast to northwest. Major pipeline corridors parallel I-40 and I-10 north and south of the SEZ, respectively.

9.2.22.3 General Trends

9.2.22.3.1 Population Growth

Table 9.2.22.3-1 presents recent and projected population numbers for the 50-mi (80-km) radius two-county ROI and in California as a whole. Population in the ROI stood at 4,189,515 in 2008, having grown at an average annual rate of 3.1% since 2000. Growth rates for the two counties in the ROI were higher than those for California as a whole (1.4%) over the same period.

Both counties in the ROI have experienced growth in population since 2000. Between 2000 and 2008, population grew at an annual rate of 3.8% in Riverside County and 2.4% in San Bernardino County. The ROI population is expected to increase to 5,584,241 by 2021 and to 5,780,284 by 2023 (California Department of Finance 2010).

TABLE 9.2.22.3-1 ROI Population for the Proposed Iron Mountain SEZ

Location	2000	2008	Average Annual Growth Rate, 2000–2008 (%)	2021	2023
Riverside County	1,559,039	2,103,050	3.8	2,965,113	3,085,643
San Bernardino County	1,721,942	2,086,465	2.4	2,619,128	2,694,641
ROI	3,280,981	4,189,515	3.1	5,584,241	5,780,284
California	34,105,437	38,129,628	1.4	44,646,420	45,667,413

Sources: U.S. Bureau of the Census (2009f); California Department of Finance (2010).

9.2.22.3.2 Energy Demand

The growth in energy demand is related to population growth through increases in housing, commercial floor space, transportation, manufacturing, and services. With population growth expected in Imperial, Riverside, and San Bernardino Counties between 2006 and 2016, an increase in energy demand also is expected. However, the EIA projects a decline in per-capita energy use through 2030, mainly because of improvements in energy efficiency and the high cost of oil throughout the projection period. Primary energy consumption in the United States between 2007 and 2030 is expected to grow by about 0.5% each year; the fastest growth is projected for the residential, commercial and industrial sectors, which are expected to grow by about 0.5%, 0.4%, and 0.1%, respectively, (industrial) each year (EIA 2009).

9.2.22.3.3 Water Availability

Because of its remote location and lack of agricultural and residential users, the Iron Mountain SEZ is not in an area of extensive water use. The majority (98%) of the proposed Iron Mountain SEZ is located within the Ward Valley groundwater basin, and the southeastern corner (2%) is located in the Rice Valley groundwater basin. From a regional perspective, groundwater recharge in the eastern Mojave Desert is largely supplied by rainfall and snowmelt runoff at higher elevations, and groundwater discharge is primarily through interbasin flows and evaporation from low-elevation playas (MWD 2001). Information on the groundwater aquifers in the Ward Valley is limited because of the historically low level of development in this region. The groundwater storage capacity for the Ward Valley groundwater basin is estimated to be 8.7 million ac-ft (11 billion m^3), on the basis of basin size and estimates of alluvium depths. The natural groundwater recharge is estimated to be 2,700 ac-ft/yr (3.3 million m^3/yr), and the groundwater discharge at Danby Lake is estimated to range from 11,000 to 22,000 ac-ft/yr (13.6 million to 27.2 million m^3/yr) (CDWR 2003).

Historically, groundwater withdrawals have been used to support small farms and vineyards, railroads, and salt-mining industries (MWD 2001). Between 1901 and 1947, groundwater withdrawals averaged 50 ac-ft/yr (61,700 m^3/yr), but have dropped off because of railroads switching from steam to diesel engines. Withdrawals currently range from 2 to 8 ac-ft/yr (2,500 to 9,900 m^3/yr) (MWD 2001; CDWR 2003). Groundwater levels range from near surface at Danby Dry Lake to 700 ft (229 m) below the surface (CDWR 2003). A USGS monitoring well located on the northwestern corner of the proposed SEZ showed steady groundwater levels at 93 ft (28 m) below the surface from 1964 to 1984 (USGS 2009, well number 341627115102901). Other USGS wells within the adjacent Cadiz Valley and Rice Valley groundwater basins have also shown steady groundwater levels (USGS 2009, well numbers 340500114505801, 340424114484801, 340300114473301, 342513115220001). Well yields within the Ward Valley groundwater basin have been reported between 10 and 260 gpm (38 and 984 L/min) (CDWR 2003). Cadiz, Inc. reported total groundwater yields of up to 3,700 gpm (14,000 L/min) for its agricultural production wells, which are 25 mi (40 km) northwest of the proposed SEZ in the Cadiz Valley groundwater basin (MWD 2001).

The most extensive water use in the region is in western San Bernardino County. In 2005, water withdrawals from surface waters and groundwater in San Bernardino County were 656,900 ac-ft/yr (860 million m^3/yr), 57% of which came from surface waters and 43% from groundwater. The largest water use category was municipal and domestic supply, at 427,100 ac-ft/yr (527 million m^3/yr). However, the majority of this water was used in the larger cities in the southwestern portion of San Bernardino County. Agricultural water uses accounted for 167,000 ac-ft/yr (206 million m^3/yr), while industrial and thermoelectric water uses accounted for 29,150 and 33,630 ac-ft/yr (36 million and 41 million m^3/yr), respectively (Kenny et al. 2009). Water uses in western San Bernardino County, however, may be too far away to affect water resources at the proposed Iron Mountain SEZ.

9.2.22.3.4 Climate Change

Global warming has continued to affect many desert areas in the southwestern United States with increased temperatures and prolonged drought during the past 20 to 30 years. A report on global climate change in the United States prepared on behalf of the National Science and Technology Council by the U.S. Global Research Program documents current temperature and precipitation conditions and historic trends, and projects impacts during the remainder of the 21st century through modeling using low and high scenarios of global GHG emissions. The report summarizes the science of climate change and the recent and future impacts of climate change on the United States (Global Climate Research Program 2009). The following excerpts from that report indicate that there has been a trend for increased global temperature and decreased annual precipitation in desert regions:

- Average temperatures in the United States increased more than 2ºF (1.1ºC) over the period 1957 to 2007.

- Southern areas, particularly desert regions of southern Arizona and southeastern California, have experienced longer droughts and are projected to have more severe periods of drought during the remainder of the 21st century. Much of the Southwest has experienced drought conditions since 1999. This period represents the most severe drought in 110 years.

- The incidence of wildfires in the western United States has increased in recent decades, partly because of increased drought.

- Temperature increases in the next 20 to 30 years are expected to be strongly correlated with past emissions of heat-trapping gases, such as CO_2 and CH_4.

- Many extreme weather events have increased both in frequency and intensity during the last 40 to 50 years. Precipitation and runoff are expected to decrease in the Southwest in spring and summer based on current data and anticipated temperature increases. Water use will increase over the next several decades as the population of southern California grows, resulting in trade-offs among competing uses.

- Climate project models also show a 10 to 20% decline in runoff in California and Nevada for the period 2041 to 2060, compared with data from 1901 to 1970 used as a baseline.

- In the Southwest, average temperatures increased about 1.5ºF (0.8ºC) in 2000 compared to a baseline period of 1960 to 1979. By the year 2020, temperatures are projected to rise 2 to 3ºF (1.1 to 1.7ºC) above the 1960 to 1979 baseline.

Increased global temperatures from GHG emissions will likely continue to exacerbate drought in the southern California deserts. The State of California has prepared several reports of climate change impact predictions through the remainder of the 21st century that address such topics as economics, ecosystems, water use/availability, impacts on Santa Ana winds, agriculture, timber production, and snowpack. The California climate change portal Web site (http://www.climatechange.ca.gov/publications/cat/index.html) lists the Climate Action Team reports that are submitted to the Governor and state legislature. These reports are included as final papers of the CEC's Public Interest Energy Research Program.

9.2.22.4 Cumulative Impacts on Resources

This section addresses potential cumulative impacts in the proposed Iron Mountain SEZ on the basis of the following assumptions: (1) because of the relatively large size of the proposed SEZ (more than 30,000 acres [121 km^2]), as many as three projects could be constructed at a time, and (2) maximum total disturbance over 20 years would be about 85,217 acres (345 km^2) (80% of the entire proposed SEZ). For analysis, it is also assumed that no more than 3,000 acres (12.1 km^2) would be disturbed per project annually and 250 acres (1.01 km^2) monthly on the basis of construction schedules planned in current applications. For this analysis, the impacts of construction and operation of transmission lines outside of the SEZ were not assessed, assuming that the existing 230-kV transmission line might be used to connect some new solar facilities to load centers and that additional project-specific analysis would be performed for new transmission construction or line upgrades. Regarding site access, because State Route 62, a two-lane highway, passes through the southern edge the SEZ, no major road construction activities outside of the SEZ would be needed for development to occur in the SEZ.

Cumulative impacts in each resource area that would result from the construction, operation, and decommissioning of solar energy development projects within the proposed SEZ when added to other past, present, and reasonably foreseeable future actions described in the previous section are discussed below. At this stage of development, because of the uncertainties of the future projects in terms of location within the proposed SEZ, size, number, and the types of technology that would be employed, the impacts are discussed qualitatively or semi-quantitatively, with ranges given as appropriate. More detailed analyses of cumulative impacts would be performed in the environmental reviews for the specific projects in relation to all other existing and proposed projects in the geographic areas.

9.2.22.4.1 Lands and Realty

The area covered by the proposed Iron Mountain SEZ is in a remote, rural, and largely undeveloped portion of the eastern Mojave Desert. While the SEZ comprises only BLM-administered lands, about 2,560 acres (10.4 km^2) of private lands and about 640 acres (2.5 km^2) of state lands are included within the external boundary of the SEZ. Another 560 acres (2.3 km^2) of state land is located adjacent to the southern boundary of the SEZ.

Development of the SEZ would introduce a highly contrasting industrialized land use into an area that is largely rural. In addition, numerous renewable energy projects are proposed within a 50-mi (80-km) radius of the Iron Mountain SEZ. As shown in Table 9.2.22.2-2 and Figure 9.2.22-2, as many as 29 solar projects and 9 wind projects have pending applications within this distance, with ROW applications totaling over 290,000 acres (1,170 km^2), including over 20,000 acres (81 km^2) for five advanced solar proposals (Section 9.2.22.2.1). As a result of the potential and likely development of other renewable energy projects and accompanying transmission lines, roads, and other infrastructure within the geographic extent of effects, the character of a large portion of the California Desert could be dramatically changed. The contribution to cumulative impacts of utility-scale solar projects on public lands on and around the Iron Mountain SEZ could be significant, particularly if the SEZ is fully developed with solar projects. Development of the public lands for solar energy production may also result in similar development on the state and private lands in the immediate vicinity of the SEZ.

Construction of utility-scale solar energy facilities within the SEZ would preclude use of those areas occupied by the solar energy facilities for other purposes. The areas that would be occupied by the solar facilities would be fenced, and access to those areas by both the general public and wildlife would be eliminated.

9.2.22.4.2 *Specially Designated Areas and Lands with Wilderness Characteristics*

The Iron Mountain SEZ is surrounded by areas of high wilderness and scenic value, including 11 wilderness areas with a potential view of the SEZ within 25 mi (40 km). The Turtle Mountain ACEC, the Chemehuevi DWMA, and the Patton Iron Mountain Divisional Camp ACEC are located nearby. Construction of utility-scale solar energy facilities within the SEZ in combination with potential development of other renewable energy projects and associated infrastructure would have the potential for contributing to the adverse visual impacts on these specially designated areas. Development of the SEZ, especially full development, would be a dominant factor in the viewshed from large portions of these specially designated areas.

Solar development of the Iron Mountain and Riverside East SEZs, together with the Rice Solar Development on private land, would combine to adversely affect wilderness values in the Rice Valley and Palen-McCoy WAs. Development within Iron Mountain and Riverside East SEZs would also combine to affect Joshua Tree National Park and wilderness within the park. The Cadiz Valley to the northwest of Iron Mountain SEZ, in particular, has a large number of pending wind and solar applications that may result in cumulative effects on sensitive areas.

9.2.22.4.3 *Rangeland Resources*

The SEZ is not included within a grazing allotment, and, therefore, solar development of the area would not contribute to any cumulative effects on livestock grazing. Likewise, since SEZ is not located within either an HA or HMA, there would be no contribution to any adverse effects on wild horses or burros.

9.2.22.4.4 *Recreation*

The Iron Mountain SEZ is flat and is of a type and quality that generally does not attract recreational users. However, access into the area is easy, and low levels of recreational use do occur, including backcountry driving, visiting of historical sites, hiking, recreational shooting, hunting, and wildlife and wildflower viewing. It is anticipated there would not be a significant loss of recreational use caused by development of the Iron Mountain SEZ, although some users would be displaced. Cadiz Road that passes through the area is an important travel route for people accessing areas adjacent to the SEZ. Access to public lands to the east of the SEZ could be adversely affected by solar energy development if provision is not made to maintain public road access around or through any solar development areas.

When SEZ development is considered in combination with other potential renewable energy development within the region, a potential would exist for cumulative visual impacts on recreational users of the specially designated areas surrounding the SEZ (Section 9.2.22.4.2) and for users who enjoy backcountry driving. There is substantial potential for loss of wilderness and scenic values throughout the California Desert wherever solar and wind energy development encroaches on wilderness or on other currently undeveloped areas. The overall cumulative impacts on recreational use associated with the loss of wilderness values and general open desert scenery also could be large. While the effects cannot be quantified, desert users might avoid areas dominated by industrial-type solar facilities. This could result a fundamental change in the way the California Desert has been traditionally used.

9.2.22.4.5 Military and Civilian Aviation

The proposed Iron Mountain SEZ is located under five MTRs which are part of a very large, interconnected system of training routes throughout the southwest. The development of any solar energy or transmission facilities that encroach into the airspace of MTRs could create safety issues and could conflict with military training activities. While the military has indicated that solar development on portions of the Iron Mountain SEZ is compatible with its existing uses, it has also commented that other portions should have height limits for facilities, and some areas may be incompatible with existing military use. Potential solar development occurring throughout the region, which is currently undeveloped, could result in small cumulative effects on the system of MTRs. Such effects would be limited by mitigations developed in consultation with the military.

There are no civilian aviation facilities in the vicinity of the SEZ and therefore there would be no potential for cumulative effects.

9.2.22.4.6 Soil Resources

Ground-disturbing activities (e.g., grading, excavating, and drilling) during the construction phase of a solar project, including any associated transmission lines, would contribute to the soil loss due to erosion. Construction of new roads within the SEZ or improvements to existing roads would also contribute to soil erosion. During construction, operations, and decommissioning of the solar facilities, worker travel and other road use would also contribute to soil loss. These losses would be in addition to losses occurring as a result of disturbance caused by other users in the area, including from potential construction of several other renewable energy facilities, and recreational users, such as off-road vehicle enthusiasts. As discussed in Section 9.2.7.3, programmatic design features would be employed to minimize erosion and loss of soil during the construction, operation, and decommissioning phases of the solar facilities and any associated transmission lines. Landscaping of solar energy facility areas could alter drainage patterns and lead to increased siltation of surface water streambeds, in addition to that caused by other development activities. Even with the expected design features in place, cumulative impacts from the disturbance of several large sites and connecting linear facilities in the vicinity could be significant.

9.2.22.4.7 Minerals (Fluids, Solids, and Geothermal Resources)

No locatable mining claims, oil and gas leases, or geothermal leases occur within the proposed Iron Mountain SEZ, and for that reason it is assumed there would be no cumulative effect on these mineral resources. The SEZ is still open for discretionary mineral leasing, including leasing for oil and gas and other leasable minerals.

The SEZ currently includes about 23,000 acres (93 km^2) of the Danby Lake KSLA, an area that has been determined by the BLM to contain valuable sodium mineral deposits. Within the KSLA, multiple use-management may allow for uses other than sodium mineral development, but only if those other uses do not interfere with or restrict the production of sodium minerals. Solar energy development within the KSLA, while generally unsuitable due to soil conditions, would be secondary to the production of sodium, and there would be no impact on the sodium resource.

9.2.22.4.8 Water Resources

The water requirements for development and operation of various utility-scale solar energy technologies on the proposed SEZ are described in Section 9.2.9.2. If the SEZ was fully developed over 80% of its available land area, the amount of water needed during the peak construction year for the various solar technologies evaluated would be 4,541 to 6,732 ac-ft (5,600 to 8,300 thousand m^3). The amount of water needed during decommissioning would be similar to or less than the amount used during construction. During operations, the amount of water needed for all solar technologies evaluated would range from 479 to 255,900 ac-ft/yr (0.59 to 316 million m^3 /yr), with PV representing the lower end of this range. Since the availability of groundwater (the primary water resource available to solar energy facilities in the SEZ) is limited, it would not be feasible to obtain the upper end of the water requirements range. A sustainable water use rate might be assumed to equal the estimated recharge rate for the Ward Valley of 2,700 ac-ft/yr (3.3 million m^3/yr), which would severely limit the amount of wet-cooled trough or tower technology that could be built.

The levels of water use needed for build-out with wet cooling are clearly not feasible with the water resources available to the region, and estimated recharge rates would support only on the order of 500 MW of wet-cooled solar trough or power tower output. Conversely, PV development would have minimal impacts on groundwater sources. Full-build out of the proposed Iron Mountain SEZ with dry-cooling trough or tower facilities and/or dish engine facilities would also not be possible without exceeding recharge rates under the water use assumptions used in the PEIS. Implementation of water conservation measures (e.g., for mirror washing) might allow increased development of these types of facilities without exceeding recharge rates.

Currently one application (dated April 2, 2007) for development of a solar energy project within the Iron Mountain SEZ is pending: application CACA 49002 from Leopold Company LLC for a 4,100-MW CSP facility (Table 9.2.22.2-2). With technology-specific water use rates (Section 9.2.9) and solar trough technology, such a facility could require up to 60,000 ac-ft/yr (74 million m^3/yr) if wet cooled, or 6,000 ac-ft/yr (7.4 million m^3/yr) if dry cooled, assuming 60% operating time in each case. Impacts on the Ward Valley aquifer would be large under the wet-cooling scenario, but might be sustainable under the dry-cooling scenario, assuming the application of water conservation measures.

The development of the five advanced solar proposals identified within the geographic extent of effects (Section 9.2.22.2.1) could draw up to 8,000 ac-ft (9.9 million m^3/yr) of water to support construction during the period 2011–2013, and up to 2,700 ac-ft/yr (3.3 million m^3/yr) during the following operational period of approximately 30 years. However, four of these projects would be about 25 mi (40 km) south of the proposed SEZ and would not draw from the Ward Valley or Rice Valley groundwater basins. Only the Rice Solar Energy Project, with construction water use of 780 ac-ft/yr (0.96 million m^3/yr) and operational water use of 180 ac-ft/yr (0.22 million m^3/yr), would cumulatively affect the Iron Mountain SEZ. However, only 2% of the SEZ lies over the Rice Valley basin; 98% of the SEZ lies over the Ward Valley basin (Section 9.2.9.1.2). Likewise, the several pending solar energy project proposals for locations west and northwest of the SEZ (Figure 9.2.22.2-1), if approved, would likely draw from the Cadiz Valley groundwater basin and thus not contribute significantly to cumulative impacts within the SEZ. Therefore, cumulative impacts on groundwater basins underlying the Iron Mountain SEZ from currently foreseeable projects would be minimally greater than the impacts from solar energy development within the SEZ.

Similarly, with respect to wastewaters, the small quantities of sanitary wastewater that would be generated during the construction and operation of utility-scale solar energy facilities within the Iron Mountain SEZ in combination with similarly small volumes from other foreseeable projects would not be expected to strain available sanitary wastewater treatment facilities in the general area of the SEZ. Blowdown water from cooling towers for wet-cooled technologies would be treated within a project site (e.g., in settling ponds) and injected into the ground, released to surface water bodies, or reused, and thus would not contribute cumulative impacts on any nearby treatment systems.

9.2.22.4.9 Vegetation

The proposed Iron Mountain SEZ is located within the Sonoran Basin and Range ecoregion, which supports creosote bush (*Larrea tridentata)* and white bursage (*Ambrosia* sp.) plant communities with large areas of palo verde (*Parkinsonia* sp.) cactus shrub and saguaro cactus (*Carnegiea gigantea*) communities. No wetlands occur within the SEZ or within the 5-mi (8-km) area of indirect effects. Riparian communities occur along larger washes and include tamarisk, mesquite, and ironwood. Danby Lake is a dry lakebed most of the year; it is primarily classified as North American Warm Desert Playa. The occurrences of the Sonora-Mojave Mixed Salt Desert Scrub, North American Warm Desert Active and Stabilized Dune, and North American Warm Desert Volcanic Rockland cover types in the SEZ are within Danby Lake. If utility-scale solar energy projects were to be constructed within the SEZ, all vegetation within the footprints of the facilities would likely be removed during land-clearing and land-grading operations. Primarily affected would be communities of the Sonora–Mojave Creosotebush–White Bursage Desert Scrub, North American Warm Desert Playa, North American Warm Desert Wash, North American Warm Desert Bedrock Cliff and Outcrop cover types. Solar development could result in large impacts on North American Warm Desert Playa associated with Danby Lake (however, solar project development in that area is unlikely), moderate impacts on Sonora-Mojave Creosotebush-White Bursage Desert Scrub, North American Warm Desert

Wash, Sonora-Mojave Mixed Salt Desert Scrub, North American Warm Desert Pavement, and Developed, Open Space—Low Intensity, and small impacts on the remaining cover types.

Numerous other renewable energy projects are proposed within a 50-mi (80-km) radius of the Iron Mountain SEZ. As many as 29 other solar projects and 9 wind projects have pending applications within this distance, with ROW applications totaling more than 500,000 acres (2,000 km^2), including about 20,000 acres (81 km^2) for five advanced solar proposals (Section 9.2.22.2.1). Depending on the actual development of renewable energy projects within and outside the SEZ and accompanying transmission lines, roads, and other infrastructure within the geographic extent of effects, cumulative impacts on certain cover types could be significant, particularly those that favor the basin flats, which are suitable for solar facilities.

In addition, the cumulative effects of fugitive dust generated during the construction of solar facilities along with other activities in the area, such as transportation and recreation, could increase the dust loading in habitats outside a solar project area, which could result in reduced productivity or changes in plant community composition. Programmatic design features would be implemented to reduce the impacts from solar energy projects and thus reduce the overall cumulative impacts on plant communities and habitats.

9.2.22.4.10 Wildlife and Aquatic Biota

As many as 167 species of amphibians (1 species), reptiles (31 species), birds (100 species), and mammals (35 species) occur in and around the proposed Iron Mountain SEZ (Section 9.2.11). The construction of utility-scale solar energy projects in the SEZ and of any associated transmission lines and roads in or near the SEZ would have impacts on wildlife through habitat disturbance (i.e., habitat reduction, fragmentation, and alteration), wildlife disturbance, loss of connectivity between natural areas (e.g., habitat fragmentation and blockage of dispersal corridors for bighorn sheep and desert tortoise), and wildlife injury or mortality. In general, affected species with broad distributions and occurring in a variety of habitats would be less affected than species with a narrowly defined habitat within a restricted area. Programmatic design features include pre-disturbance biological surveys to identify key habitat areas used by wildlife, followed by avoidance or minimization of disturbance to those habitats (e.g., avoiding development in Homer Wash).

Up to 29 other solar projects and 9 wind projects have pending applications within 50 mi (80 km) of the SEZ, including several within the proposed Riverside East SEZ about 25 mi (40 km) to the south. These ROW applications total more than 500,000 acres (2,000 km^2), including about 20,000 acres (81 km^2) for five advanced solar proposals (Section 9.2.22.2.1). Depending on the actual development of renewable energy projects within and outside the SEZ and of accompanying transmission lines, roads, and other infrastructure within the geographic extent of effects, cumulative impacts on some wildlife species could be significant, particularly those with habitats or migratory routes in the basin flats, which are suitable for solar facilities.

While many of the wildlife species have extensive habitat available within the affected counties, where projects are closely spaced, the cumulative impact on a particular species could be moderate to large. Programmatic design features would be used to reduce the impacts from solar energy projects and thus reduce the overall cumulative impacts on wildlife. However, even with mitigations in place, cumulative impacts could be moderate within the geographic extent of effects.

No wetlands are present within the proposed SEZ. However, Danby Lake, while normally dry, supports high densities of aquatic invertebrates such as brine shrimp; which provide important seasonal feeding resources for shorebirds and other wildlife. There would be no cumulative impacts on aquatic biota and habitats resulting from solar development within the SEZ as long as development in Danby Lake is avoided. Increased future demand on groundwater for multiple uses, including solar power development within the SEZ, could affect surface water levels outside of the SEZ, and, as a consequence, could affect aquatic organisms in those water bodies.

9.2.22.4.11 Special Status Species (Threatened, Endangered, Sensitive, and Rare Species)

Five special status species are known to occur within the affected area of the Iron Mountain SEZ: Harwood's eriastrum, Mojave fringe-toed lizard, Bendire's thrasher, hepatic tanager, and Nelson's bighorn sheep. In addition, designated critical habitat for the desert tortoise and ESA species listed as threatened in California occurs within the affected area adjacent to the SEZ boundary. Numerous additional species occurring on or in the vicinity of the SEZ are listed as threatened or endangered by the states of California or Arizona or are listed as a sensitive species by the BLM. Programmatic design features that could be used to reduce or eliminate the potential for cumulative effects on these species from the construction and operation of utility-scale solar energy projects within the geographic extent of effects include avoidance of habitat and minimization of erosion, sedimentation, and dust deposition. In addition, translocation could be used to minimize take of individuals.

Numerous reasonably foreseeable future actions could occur within the geographic extent of effects of the proposed Iron Mountain SEZ, including 29 solar and 9 wind applications for projects that would cover up to 500,000 acres (2,023.4 km^2). A number of sensitive species have been identified within the boundaries of the five advanced solar proposals covering 20,000 acres (80.9 km^2) discussed in Section 9.2.22.2. These species include the federally or state-listed desert tortoise, Mojave fringe-toed lizard, Colorado fringe-toed lizard, Western burrowing owl, short-eared owl, prairie falcon, northern harrier, loggerhead shrike, California horned lark, desert kit fox, and several California-listed sensitive plant species.

The four fast-track solar energy proposals would occur within the proposed Riverside East SEZ, about 25 mi (40 km) south of the Iron Mountain SEZ. Many special status species with potential habitat impacts from solar development are common to both the Riverside East and Iron Mountain SEZs, including the desert tortoise and Mojave fringe-toed lizard. However, projects in these and other areas would employ design features to reduce or eliminate the impacts on protected species as required by the ESA and other applicable federal and state laws and regulations.

Depending on the number and size of other projects that will actually be built within the next 20 to 30 years within the geographic extent of effects, there could be cumulative impacts on protected species due to habitat destruction and overall development and fragmentation of the area. Habitats that are particularly at risk are those in basin flats suited for solar development. In particular, the functioning of the Chemehuevi DWMA could be cumulatively affected with respect to connectivity, control of desert tortoise disease, and predation. Together, several new solar facilities and the other associated actions would have a cumulative impact on wildlife. Where projects are closely spaced, the cumulative impact on a particular species could be moderate to large.

9.2.22.4.12 Air Quality and Climate

While solar energy generates minimal emissions compared with fossil fuel–generated energy, the site preparation and construction activities associated with solar energy facilities would produce some emissions, mainly particulate matter (fugitive dust) and emissions from vehicles and construction equipment. When these emissions are combined with those from other projects near solar energy facilities or when they are added to natural dust generated by winds and windstorms, the air quality in the general vicinity of the projects could be temporarily degraded. For example, particulate matter (dust) concentration at or near the SEZ boundaries could at times exceed state or federal ambient air quality standards. Generation of dust from construction activities can be partially controlled by implementing aggressive dust control measures, such as increased watering frequency or road paving or treatment.

Several other renewable energy projects are proposed or planned within the air basin shared by Iron Mountain (Section 9.2.22.2.1 and Figure 9.2.22.2-1), while the Riverside East SEZ lies about 25 mi (40 km) south. Concurrent construction of solar facilities at the two SEZs could have cumulative impacts. Four fast-track proposed projects lie in the Riverside East SEZ, while a total of 29 solar and 9 wind proposals are pending within 50 mi (80 km) of the Iron Mountain SEZ. The fast-track projects have overlapping construction schedules for the period 2011 to 2013. These projects in combination with others with pending applications could produce periods of elevated particulate emissions in the affected area.

Over the long term and across the region, the development of solar energy may have beneficial cumulative impacts on the air quality and atmospheric values in southern California by offsetting the need for energy production with fossil fuels, which result in higher levels of emissions. As discussed in Section 9.2.13, air emissions from operating solar energy facilities are relatively minor, while the displacement of criteria air pollutants, VOCs, TAPs, and GHG emissions currently produced from fossil fuels could be relative large. For example, if the Iron Mountain SEZ was fully developed (80% of its acreage) with solar facilities, the quantity of pollutants avoided could be as large as 28% of all emissions from the current electric power systems in California.

9.2.22.4.13 Visual Resources

The Ward Valley in the Mohave Desert is flat and is characterized by wide open views. Generally good air quality and a lack of obstructions allow visibility for 50 mi (80 km) or more under favorable atmospheric conditions. The proposed SEZ site is a generally flat to gently rolling, largely treeless plain; the strong horizon line is the dominant visual feature. The VRI values for the SEZ and immediate surroundings are VRI Class II, indicating high relative visual values, Class III, indicating moderate relative visual values, and Class IV, indicating low relative visual values..The inventory indicates relatively low levels of use and public interest; however, the site is within the viewshed of 11 congressionally designated wilderness areas, a National Natural Landmark, a scenic ACEC, and is within the California Desert Conservation Area, indicating high visual sensitivity. The site is also visible from several other ACECs and in general is close to other specially designated areas, indicating moderate visual sensitivity.

Development of utility-scale solar energy projects within the SEZ would contribute to the cumulative visual impacts in the general vicinity of the SEZ and in the Ward Valley. However, the exact nature of the visual impacts and the design features that would be appropriate would depend on the specific project locations within the SEZ and on the solar technologies used. Such impacts and potential design features would be considered in visual analyses conducted for specific future projects. In general, large visual impacts on the SEZ would be expected to occur as a result of the construction, operation, and decommissioning of utility-scale solar energy projects. These impacts would be expected to involve major modification of the existing character of the landscape and would likely dominate the views for some nearby viewers. Additional impacts would occur as a result of the construction, operation, and decommissioning of related facilities, such as access roads and electric transmission lines.

Because of the large size of utility-scale solar energy facilities, the large number of pending applications on public lands in the area, and the generally flat, open nature of the proposed SEZ, some lands outside the SEZ would also be subjected to visual impacts related to the construction, operation, and decommissioning of utility-scale solar energy development. Potential impacts would include night sky pollution, including increased skyglow, light spillage, and glare. Some of the affected lands outside the SEZ would include potentially sensitive scenic resource areas, including the 11 wilderness areas, the scenic ACEC, the National Natural Landmark; and the CDCA. These sensitive visual resource areas would be subject to major to minimal visual impacts. Visual impacts resulting from solar energy development within the SEZ would be in addition to impacts caused by other potential projects in the area, such as other solar facilities on private lands, transmission lines, and other renewable energy facilities, including windmills. The presence of new facilities would normally be accompanied by increased numbers of workers in the area, traffic on local roadways, and support facilities, all of which would add to cumulative visual impacts.

As many as 29 other solar projects and 9 wind projects have pending applications on public lands within 50 mi (80 km) of the SEZ, including several within the proposed Riverside East SEZ about 25 mi (40 km) to the south. While the overall extent of cumulative effects of renewable energy development in the area would depend on the number of projects that are actually are built, it may be concluded that the general visual character of the landscape could be transformed from primarily rural desert to more commercial-industrial in nature as a consequence of these projects. Because of the topography of the region, solar facilities, located in flat basins, would be visible at great distances from sensitive viewing locations in the surrounding mountains. Also, the facilities would be located near major roads, thus the facilities would be viewable by motorists. However, some portions of major roads where solar energy facilities would be located are currently visually affected by transmission line corridors, towns, and other infrastructure, as well as the road system itself.

In addition to cumulative visual impacts associated with views of particular future facilities, as additional facilities are added, several projects might become visible from one location or in succession as viewers move through the landscape, such as driving on local roads. In general, the new facilities would likely vary in appearance, and depending on the number and type of facilities, the resulting visual disharmony could exceed the visual absorption capability of the landscape and add significantly to the cumulative visual impact. Thus, the overall cumulative visual impacts in the region from solar and wind energy development would be significant.

9.2.22.4.14 Acoustic Environment

The areas around the proposed Iron Mountain SEZ and in Bernardino County, in general, are relatively quiet. The existing noise sources include road traffic, infrequent railroad traffic, aircraft flyovers, industrial activities including sodium mining and pumping activities, and activities and events at nearby IMPS residences. During construction of solar energy facilities, construction equipment could increase the noise levels over short durations during the day. After the facilities are constructed and begin operating, there would be little or minor noise impacts for any of the technologies, except from solar dish engine facilities and from parabolic trough or power tower facilities using TES. It is possible that residents could be cumulatively affected by more than one solar or other development built in close proximity to the SEZ, particularly at night when the noise is more discernable due to relatively low background levels. However, such cumulative impacts are unlikely due the expected wide separation of facilities and the sparse population of the region.

9.2.22.4.15 Paleontological Resources

The potential for impacts on significant paleontological resources at the Iron Mountain SEZ in Ward Valley is unknown. The area around Danby Lake has a high potential to contain paleontological deposits and would require a paleontological survey. Further, the specific sites selected for future projects would be surveyed if determined to be necessary by the BLM, and any paleontological resources would be avoided or mitigated to the extent possible. A similar process would be employed at other facilities constructed in the area, and no significant cumulative impacts on paleontological resources are expected.

9.2.22.4.16 Cultural Resources

Ward Valley as a whole, and Danby Lake in particular were important areas for gathering both salt and food resources for both the Mohave and Chemehuevi. The remains of campsites are scattered throughout the valley, and there are panels of rock art in the adjacent mountains. Direct impacts on significant cultural resources during site preparation and construction activities could occur in the proposed Iron Mountain SEZ. However, further investigation would be needed, including a cultural resource survey of the entire area of potential effects to identify historic properties. It is possible that the development of utility-scale solar energy projects in the Iron Mountain SEZ and of other projects likely to occur in the area could contribute cumulatively to cultural resource impacts. However, historic properties would be avoided or mitigated to the extent possible in accordance with state and federal regulations. Similarly, through ongoing consultation with the California SHPO and appropriate Native American governments, it is likely that many adverse effects on significant resources in the Ward Valley could be mitigated to some extent. Some visual and landscape scale impacts may not be mitigatable to the satisfaction of all interested parties. The increment of adverse effects from solar energy development on the overall cumulative effect on cultural resources would depend on the nature of the resources affected and could be significant.

9.2.22.4.17 Native American Concerns

Government-to-government consultation is under way with Native American governments with possible traditional ties to the Ward Valley. In the past, the Chemehuevi have expressed concerns over the Salt Song Trail, which passes just west of the SEZ, and the Quechan Indian Tribe of the Fort Yuma Reservation stressed the importance of evaluating impacts on landscapes as a whole within their Tribal Traditional Use Area. Solar development within the SEZ could have negative effects on the trail. It is possible that the development of utility-scale solar energy projects in the SEZ, when added to other potential projects likely to occur in the area, including renewable energy projects outside the SEZ, could contribute cumulatively to visual impacts and other Native American concerns in the valley. Continued discussions with the area Tribes through government-to-government consultation is necessary to effectively consider and address the Tribes’ concerns related to solar energy development in the Ward Valley.

9.2.22.4.18 Socioeconomics

Solar energy development projects in the proposed Iron Mountain SEZ could cumulatively contribute to socioeconomic effects in the immediate vicinity of the SEZs and in the surrounding multicounty ROI. The effects could be positive (e.g., creation of jobs and generation of extra income, increased revenues to local governmental organizations through additional taxes paid by the developers and workers) or negative (e.g., added strain on social institutions such as schools, law enforcement agencies, and health care facilities). Impacts from solar development would be most intense during facility construction, but of greatest duration during operations. Construction in the Iron Mountain SEZ and at other new projects in the area, including other renewable energy development, would temporarily increase the number of workers in the area needing housing and services. The number of workers involved in the construction of solar projects in the proposed Iron Mountain SEZ alone could range from about 400 to 5,200 in the peak construction year, depending on the technology being employed, with solar PV facilities at the low end and solar trough facilities at the high end. The total number of jobs created in the area could range from approximately 1,200 (solar PV) to as high as 16,000 (solar trough).

Cumulative socioeconomic effects in the ROI from construction of solar facilities would occur to the extent that multiple construction projects of any type were ongoing simultaneously. It is a reasonable expectation that this condition would occur within a 50-mi (80 km) radius of the SEZ occasionally over the 20 or more year solar development period. Five anticipated projects with advanced proposals, including four fast-track projects located within the Riverside East SEZ, would employ up to 2,300 construction workers during the period 2011 to 2013 (Section 9.2.22.2.1). This number of workers could place a modest short-term strain on local resources in this sparsely populated area.

Annual impacts during the operation of solar facilities would be less, but could last 20 to 30 years, and could combine with those from other new projects in the area. The number of workers needed at the solar facilities within the SEZ would be in the range of 190 to 3,700, with approximately 260 to 6,100 total jobs created in the region. In addition, approximately 460 operation workers area estimated for the five projects with advanced proposals in the area (Section 9.2.22.2.1). Population increases resulting from renewable energy development within 50 mi (80 km) of the Iron Mountain SEZ would contribute to general population growth experienced in the region in recent years. The overall socioeconomic impacts would be positive, through the creation of additional jobs and income. The negative impacts, including some short-term disruption of rural community quality of life, would not likely be considered large enough to require specific mitigation measures.

9.2.22.4.19 Environmental Justice

No minority or low-income populations have been identified within 50 mi (80 km) of the proposed Iron Mountain SEZ in either California or Arizona, as defined under CEQ guidelines. Thus, solar development within the proposed Iron Mountain SEZ would not be expected to contribute to cumulative impacts on minority and low-income populations.

9.2.22.4.20 Transportation

During construction activities, there could be up to 1,000 workers commuting to a single construction site at the SEZ, which could double the daily traffic load on State Route 62 near the SEZ and have moderate cumulative impacts in combination with existing traffic levels and increases from additional future projects in the area. Should up to three large projects with approximately 1,000 daily workers each be under development simultaneously, an additional 6,000 vehicle trips per day could be added to State Route 62 in the vicinity of the SEZ, assuming ride-sharing was not implemented. This increase in traffic would quadruple the current average daily traffic level on State Route 62 and could have serious impacts on traffic flow during peak commute times.

Further, if construction occurred concurrently in the proposed Iron Mountain and Riverside East SEZs, which are about 20 mi (32 km) apart and both served by State Route 177/62, the increase in traffic during shift changes could be significant. Local road improvements may be necessary near site access points. Any impacts during construction activities would be temporary. The impacts could be mitigated to some degree by having different work hours within an SEZ or between the two SEZs. Traffic increases during operation would be reduced because of the lower number of workers needed to operate solar facilities and would have a smaller contribution to cumulative impacts.

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9.2.23 References

Note to Reader: This list of references identifies Web pages and associated URLs where reference data were obtained for the analyses presented in this PEIS. It is likely that at the time of publication of this PEIS, some of these Web pages may no longer be available or their URL addresses may have changed. The original information has been retained and is available through the Public Information Docket for this PEIS.

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DES 10-59 • DOE/EIS-0403 December 2010

Draft Programmatic Environmental Impact Statement for

Solar Energy Development in Six Southwestern States

Volume 3, Part 2
Chapter 9: California Proposed Solar Energy Zones

U.S. DEPARTMENT OF ENERGY

NATIONAL SYSTEM OF PUBLIC LANDS

On the cover:
Typical Solar Fields for Various Technology Types (clockwise from upper left):
Solar Parabolic Trough (Source: Hosoya et al. 2008),
Solar Power Tower (Credit: Sandia National Laboratories. Source: NREL 2010a),
Photovoltaic (Credit: Arizona Public Service. Source: NREL 2010b), and
Dish Engine (Credit: R. Montoya. Source: Sandia National Laboratories 2008).
Reference citations are available in Chapter 1.

Background photo: Parabolic trough facility from an elevated viewpoint
(Credit: Argonne National Laboratory)

Draft Programmatic Environmental Impact Statement (PEIS) for Solar Energy Development in Six Southwestern States (DES 10-59; DOE/EIS-0403)

Responsible Agencies: The U.S. Department of the Interior (DOI) Bureau of Land Management (BLM) and the U.S. Department of Energy (DOE) are co-lead agencies. Nineteen cooperating agencies participated in the preparation of this PEIS: U.S. Department of Defense; U.S. Bureau of Reclamation; U.S. Fish and Wildlife Service; U.S. National Park Service; U.S. Environmental Protection Agency, Region 9; U.S. Army Corps of Engineers, South Pacific Division; Arizona Game and Fish Department; California Energy Commission; California Public Utilities Commission; Nevada Department of Wildlife; N-4 Grazing Board, Nevada; Utah Public Lands Policy Coordination Office; Clark County, Nevada, including Clark County Department of Aviation; Dona Ana County, New Mexico; Esmeralda County, Nevada; Eureka County, Nevada; Lincoln County, Nevada; Nye County, Nevada; and Saguache County, Colorado.

Locations: Arizona, California, Colorado, Nevada, New Mexico, and Utah.

Contacts: *For further information about this PEIS, contact:* Linda Resseguie, BLM Washington Office, e-mail: linda_resseguie@blm.gov, phone: (202) 912-7337; or Jane Summerson, DOE Solar PEIS Document Manager, e-mail: jane.summerson@ee.doe.gov, phone: (202) 287-6188; or visit the PEIS Web site at http://solareis.anl.gov.

Abstract: The BLM and DOE are considering taking actions to facilitate solar energy development in compliance with various orders, mandates, and agency policies. For the BLM, these actions include the evaluation of a new BLM Solar Energy Program applicable to all utility-scale solar energy development on BLM-administered lands in six southwestern states (Arizona, California, Colorado, Nevada, New Mexico, and Utah). For DOE, they include the evaluation of developing new program guidance relevant to DOE-supported solar projects. The Draft PEIS assesses the environmental, social, and economic effects of the agencies' proposed actions and alternatives.

For the BLM, the Draft PEIS analyzes a no action alternative, under which solar energy development would continue on BLM-administered lands in accordance with the terms and conditions of the BLM's existing solar energy policies, and two action alternatives for implementing a new BLM Solar Energy Program. Under the solar energy development program alternative (BLM's preferred alternative), the BLM would establish a new Solar Energy Program of administration and authorization policies and required design features and would exclude solar energy development from certain BLM-administered lands. Under this alternative, approximately 22 million acres of BLM-administered lands would be available for right-of-way (ROW) application. A subset of these lands, about 677,400 acres, would be identified as solar energy zones (SEZs), or areas where the BLM would prioritize solar energy and associated transmission infrastructure development. Under the SEZ program alternative, the same policies and design features would be adopted, but development would be excluded from all BLM-administered lands except those located within the SEZs.

For DOE, the Draft PEIS analyzes a no action alternative, under which DOE would continue to conduct environmental reviews of DOE-funded solar projects on a case-by-case basis, and one action alternative, under which DOE would develop programmatic guidance to further integrate environmental considerations into its analysis and selection of solar projects that it will support.

The EPA Notice of Availability (NOA) of the Draft PEIS was published in the *Federal Register* on December 17, 2010. Comments on the Draft PEIS are due by March 17, 2011.

SOLAR PEIS CONTENTS

VOLUME 7

VOLUME 8

Reader's Guide

The detailed analysis of the proposed solar energy zones (SEZs) in California, provided in Sections 9.1 through 9.4, will be used to inform BLM decisions regarding the size, configuration, and/or management of these SEZs. These sections also include proposed mitigation requirements (termed "SEZ-specific design features"). Please note that the SEZ-specific summaries of Affected Environment use the descriptions of Affected Environment for the six-state study area presented in Chapter 4 of the PEIS as a basis. Also note that the SEZ-specific design features have been proposed with consideration of the general impact analyses for solar energy facilities presented in Chapter 5, and on the assumption that all programmatic design features presented in Appendix A, Section A.2.2, will be required for projects that will be located within the SEZs.

BLM will implement its SEZ-specific decisions through the BLM Record of Decision for the Final PEIS. Comments received during the review period for the Draft PEIS will inform BLM decisions.

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NOTATION

The following is a list of acronyms and abbreviations, chemical names, and units of measure used in this document. Some acronyms used only in tables may be defined only in those tables.

GENERAL ACRONYMS AND ABBREVIATIONS

AADT	annual average daily traffic
AASHTO	American Association of State Highway and Transportation Officials
AC	alternating current
ACC	air-cooled condenser
ACEC	Area of Critical Environmental Concern
ADEQ	Arizona Department of Environmental Quality
ADOT	Arizona Department of Transportation
ADWR	Arizona Department of Water Resources
AERMOD	AMS/EPA Regulatory Model
AFC	Application for Certification
AGL	above ground level
AIRFA	American Indian Religious Freedom Act
AMA	active management area
AML	animal management level
ANHP	Arizona National Heritage Program
APE	area of potential effect
APLIC	Avian Power Line Interaction Committee
APP	Avian Protection Plan
AQCR	Air Quality Control Region
AQRV	air quality-related value
ARB	Air Resources Board
ARRA	American Recovery and Reinvestment Act of 2009
ARRTIS	Arizona Renewable Resource and Transmission Identification Subcommittee
ARS	Agricultural Research Service
ARZC	Arizona and California
ATSDR	Agency for Toxic Substances and Disease Registry
AUM	animal unit month
AVWS	Audio Visual Warning System
AWBA	Arizona Water Banking Authority
AWEA	American Wind Energy Association
AWRM	Active Water Resource Management
AZ DOT	Arizona Department of Transportation
AZDA	Arizona Department of Agriculture
AZGFD	Arizona Game and Fish Department
AZGS	Arizona Geological Survey

BA	biological assessment
BAP	base annual production
BEA	Bureau of Economic Analysis
BISON-M	Biota Information System of New Mexico
BLM	Bureau of Land Management
BMP	best management practice
BNSF	Burlington Northern Santa Fe
BO	biological opinion
BOR	U.S. Bureau of Reclamation
BPA	Bonneville Power Administration
BRAC	Blue Ribbon Advisory Council on Climate Change
BSE	Beacon Solar Energy
BSEP	Beacon Solar Energy Project
BTS	Bureau of Transportation Statistics
CAA	Clean Air Act
CAAQS	California Air Quality Standards
Caltrans	California Department of Transportation
C-AMA	California-Arizona Maneuver Area
CAP	Central Arizona Project
CARB	California Air Resources Board
CAReGAP	California Regional Gap Analysis Project
CASQA	California Stormwater Quality Association
CASTNET	Clean Air Status and Trends NETwork
CAWA	Colorado Agricultural Water Alliance
CCC	Civilian Conservation Corps
CDC	Centers for Disease Control and Prevention
CDCA	California Desert Conservation Area
CDFG	California Department of Fish and Game
CDOT	Colorado Department of Transportation
CDOW	Colorado Division of Wildlife
CDPHE	Colorado Department of Public Health and Environment
CDWR	California Department of Water Resources
CEC	California Energy Commission
CEQ	Council on Environmental Quality
CES	constant elasticity of substitution
CESA	California Endangered Species Act
CESF	Carrizo Energy Solar Farm
CFR	*Code of Federal Regulations*
CGE	computable general equilibrium
CIRA	Cooperative Institute for Research in the Atmosphere
CLFR	compact linear Fresnel collector
CPC	Center for Plant Conservation
CNDDB	California Natural Diversity Database
CNEL	community noise equivalent level
CNHP	Colorado National Heritage Program

Colorado DWR	Colorado Department of Water Resources
CPUC	California Public Utilities Commission
CPV	concentrating photovoltaic
CRBSCF	Colorado River Basin Salinity Control Forum
CREZ	competitive renewable energy zone
CRSCP	Colorado River Salinity Control Program
CSA	Candidate Study Area
CSC	Coastal Services Center
CSFG	carbon-sequestration fossil generation
CSP	concentrating solar power
CSQA	California Stormwater Quality Association
CSRI	Cultural Systems Research, Incorporated
CTG	combustion turbine generator
CTPG	California Transmission Planning Group
CTSR	Cumbres & Toltec Scenic Railroad
CUP	Conditional Use Permit
CVP	Central Valley Project
CWA	Clean Water Act
CWCB	Colorado Water Conservation Board
CWHRS	California Wildlife Habitat Relationship System
DC	direct current
DHS	U.S. Department of Homeland Security
DNA	Determination of NEPA Adequacy
DNI	direct normal insulation
DNL	day-night average sound level
DoD	U.S. Department of Defense
DOE	U.S. Department of Energy
DOI	U.S. Department of the Interior
DOL	U.S. Department of Labor
DOT	U.S. Department of Transportation
DRECP	California Desert Renewable Energy Conservation Plan
DSM	demand side management
DTC/C-AMA	Desert Training Center/California–Arizona Maneuver Area
DWMA	Desert Wildlife Management Area
EA	environmental assessment
ECAR	East Central Area Reliability Coordination Agreement
ECOS	Environmental Conservation Online System (USFWS)
EERE	Energy Efficiency and Renewable Energy (DOE)
Eg	band gap energy
EIA	Energy Information Administration
EIS	environmental impact statement
EISA	Energy Independence and Security Act of 2007
EMF	electromagnetic field
E.O.	Executive Order

EPA	U.S. Environmental Protection Agency
EPRI	Electric Power Research Institute
EQIP	Environmental Quality Incentives Program
ERCOT	Electric Reliability Council of Texas
ERO	Electric Reliability Organization
ERS	Economic Research Service
ESA	Endangered Species Act of 1973
ESRI	Environmental Systems Research Institute
FAA	Federal Aviation Administration
FBI	Federal Bureau of Investigation
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Map
FLPMA	Federal Land Policy and Management Act of 1976
FONSI	Finding of No Significant Impact
FR	*Federal Register*
FRCC	Florida Reliability Coordinating Council
FSA	Final Staff Assessment
FTE	full-time equivalent
FY	fiscal year
G&TM	Generation and Transmission Modeling
GCRP	U.S. Global Climate Research Program
GDA	generation development area
GHG	greenhouse gas
GIS	geographic information system
GPS	global positioning system
GTM	Generation and Transmission Model
GUAC	Groundwater Users Advisory Council
GWP	global warming potential
HA	herd area
HAP	hazardous air pollutant
HAZCOM	hazard communication
HCE	heat collection element
HCP	Habitat Conservation Plan
HMA	Herd Management Area
HMMH	Harris Miller Miller & Hanson, Inc.
HRSG	heat recovery steam generator
HSPD	Homeland Security Presidential Directive
HTF	heat transfer fluid
HVAC	heating, ventilation, and air-conditioning

I	Interstate
IARC	International Agency for Research on Cancer
IBA	important bird area
ICE	internal combustion engine
ICWMA	Imperial County Weed Management Area
IEC	International Electrochemical Commission
IFR	instrument flight rule
IID	Imperial Irrigation District
IM	Instruction Memorandum
IMPS	Iron Mountain Pumping Station
IMS	interim mitigation strategy
INA	Irrigation Non-Expansion Area
IOP	Interagency Operating Procedure
IOU	investor-owned utility
IPPC	Intergovernmental Panel on Climate Change
ISA	Independent Science Advisor; Instant Study Area
ISB	Intermontane Seismic Belt
ISCC	integrated solar combined cycle
ISDRA	Imperial Sand Dunes Recreation Area
ISEGS	Ivanpah Solar Energy Generating System
ITP	incidental take permit
IUCNNR	International Union for Conservation of Nature and Natural Resources
IUCNP	International Union for Conservation of Nature Pakistan
KGA	known geothermal resources area
KML	keyhole markup language
KOP	key observation point
KSLA	known sodium leasing area
LCC	Landscape Conservation Cooperative
LCOE	levelized cost of energy
L_{dn}	day-night average sound level
LDWMA	Low Desert Weed Management Area
L_{eq}	equivalent sound pressure level
LLA	limited land available
LLRW	low-level radioactive waste (waste classification)
LRG	Lower Rio Grande
LSA	lake and streambed alteration
LSE	load-serving entity
LTVA	long-term visitor area
MAAC	Mid-Atlantic Area Council
MAIN	Mid-Atlantic Interconnected Network
MAPP	methyl acetylene propadiene stabilizer; Mid-Continent Area Power Pool
MCAS	Marine Corps Air Station
MCL	maximum contaminant level

MFP	Management Framework Plan
MIG	Minnesota IMPLAN Group
MLA	maximum land available
MOA	military operating area
MOU	Memorandum of Understanding
MPDS	maximum potential development scenario
MRA	Multiple Resource Area
MRI	Midwest Research Institute
MRO	Midwest Reliability Organization
MSDS	Material Safety Data Sheet
MSL	mean sea level
MTR	military training route
MWA	Mojave Water Agency
MWD	Metropolitan Water District
MWMA	Mojave Weed Management Area
NAAQS	National Ambient Air Quality Standards
NADP	National Atmospheric Deposition Program
NAGPRA	Native American Graves Protection and Repatriation Act
NAHC	Native American Heritage Commission (California)
NAIC	North American Industrial Classification System
NASA	National Aeronautics and Space Administration
NCA	National Conservation Area
NCCAC	Nevada Climate Change Advisory Committee
NCDC	National Climatic Data Center
NCES	National Center for Education Statistics
NDCNR	Nevada Department of Conservation and Natural Resources
NDEP	Nevada Division of Environmental Protection
NDOT	Nevada Department of Transportation
NDOW	Nevada Department of Wildlife
NDWP	Nevada Division of Water Planning
NDWR	Nevada Division of Water Resources
NEAP	Natural Events Action Plan
NEC	National Electric Code
NED	National Elevation Database
NEP	Natural Events Policy
NEPA	National Environmental Policy Act of 1969
NERC	North American Electricity Reliability Corporation
NHA	National Heritage Area
NHNM	National Heritage New Mexico
NHPA	National Historic Preservation Act of 1966
NID	National Inventory of Dams
NM DOT	New Mexico Department of Transportation
NLCS	National Landscape Conservation System
NMAC	*New Mexico Administrative Code*
NMBGMR	New Mexico Bureau of Geology and Mineral Resources

NMDGF	New Mexico Department of Game and Fish
NMED	New Mexico Environment Department
NMED-AQB	New Mexico Environment Department-Air Quality Board
NMFS	National Marine Fisheries Service
NMOSE	New Mexico Office of the State Engineer
NMSU	New Mexico State University
NNHP	Nevada Natural Heritage Program
NNL	National Natural Landmark
NNSA	National Nuclear Security Administration
NOA	Notice of Availability
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NP	National Park
NPL	National Priorities List
NPS	National Park Service
NRA	National Recreation Area
NRCS	Natural Resources Conservation Service
NREL	National Renewable Energy Laboratory
NRHP	*National Register of Historic Places*
NRS	*Nevada Revised Statutes*
NSC	National Safety Council
NSO	no surface occupancy
NSTC	National Science and Technology Council
NTS	Nevada Test Site
NTTR	Nevada Test and Training Range
NVCRS	Nevada Cultural Resources Inventory System
NV DOT	Nevada Department of Transportation
NWCC	National Wind Coordinating Committee
NWI	National Wetlands Inventory
NWPP	Northwest Power Pool
NWR	National Wildlife Refuge
NWSRS	National Scenic River System
O&M	operation and maintenance
ODFW	Oregon Department of Fish and Wildlife
OHV	off-highway vehicle
ONA	Outstanding Natural Area
ORC	organic Rankine cycle
OSE/ISC	Office of the State Engineer/Interstate Stream Commission
OSHA	Occupational Safety and Health Administration
OTA	Office of Technology Assessment
PA	Programmatic Agreement
PAD	Preliminary Application Document
PAH	polycyclic aromatic hydrocarbon

PAT	peer analysis tool
PCB	polychlorinated biphenyl
PCM	purchase change material
PCS	power conditioning system
PCU	power converting unit
PEIS	programmatic environmental impact statement
PFYC	potential fossil yield classification
PIER	Public Interest Energy Research
P.L.	Public Law
PLSS	Public Land Survey System
PM	particulate matter
$PM_{2.5}$	particulate matter with a mean aerodynamic diameter of 2.5 μm or less
PM_{10}	particulate matter with a mean aerodynamic diameter of 10 μm or less
POD	plan of development
POU	publicly owned utility
PPA	Power Purchase Agreement
PPE	personal protective equipment
PSD	Prevention of Significant Deterioration
PURPA	Public Utility Regulatory Policy Act
PV	photovoltaic
PVID	Palo Verde Irrigation District
PWR	public water reserve
QRA	qualified resource area
R&I	relevance and importance
RCI	residential, commercial, and industrial (sector)
RCRA	Resource Conservation and Recovery Act of 1976
RD&D	research, development, and demonstration; research, development, and deployment
RDBMS	Relational Database Management System
RDEP	Restoration Design Energy Project
REA	Rapid Ecoregional Assessment
REAT	Renewable Energy Action Team
REDI	Renewable Energy Development Infrastructure
ReEDS	Regional Energy Deployment System
REPG	Renewable Energy Policy Group
RETA	Renewable Energy Transmission Authority
RETAAC	Renewable Energy Transmission Access Advisory Committee
RETI	Renewable Energy Transmission Initiative
REZ	renewable energy zone
RF	radio frequency
RFC	Reliability First Corporation
RFDS	reasonably foreseeable development scenario
RGP	Rio Grande Project
RGWCD	Rio Grande Water Conservation District

RMP	Resource Management Plan
RMPA	Rocky Mountain Power Area
RMZ	Resource Management Zone
ROD	Record of Decision
ROI	region of influence
ROS	recreation opportunity spectrum
ROW	right-of-way
RPG	renewable portfolio goal
RPS	Renewable Portfolio Standard
RRC	Regional Reliability Council
RSEP	Rice Solar Energy Project
RSI	Renewable Systems Interconnection
RTTF	Renewable Transmission Task Force
RV	recreational vehicle
SAAQS	State Ambient Air Quality Standards
SAMHSA	Substance Abuse and Mental Health Services Administration
SCADA	supervisory control and data acquisition
SCE	Southern California Edison
SCRMA	Special Cultural Resource Management Area
SDRREG	San Diego Regional Renewable Energy Group
SDWA	Safe Drinking Water Act of 1974
SEGIS	Solar Energy Grid Integration System
SEGS	Solar Energy Generating System
SEI	Sustainable Energy Ireland
SEIA	Solar Energy Industrial Association
SES	Stirling Energy Systems
SETP	Solar Energy Technologies Program (DOE)
SEZ	solar energy zone
SHPO	State Historic Preservation Office(r)
SIP	State Implementation Plan
SLRG	San Luis & Rio Grande
SMA	Special Management Area
SMP	suggested management practice
SNWA	Southern Nevada Water Authority
SPP	Southwest Power Pool
SRMA	Special Recreation Management Area
SSA	Socorro Seismic Anomaly
SSI	self-supplied industry
ST	solar thermal
STG	steam turbine generator
SUA	special use airspace
SWAT	Southwest Area Transmission
SWIP	Southwest Intertie Project
SWPPP	Stormwater Pollution Prevention Plan
SWReGAP	Southwest Regional Gap Analysis Project

TAP	toxic air pollutant
TCC	Transmission Corridor Committee
TDS	total dissolved solids
TEPPC	Transmission Expansion Planning Policy Committee
TES	thermal energy storage
TSA	Transportation Security Administration
TSCA	Toxic Substances Control Act of 1976
TSDF	treatment, storage, and disposal facility
TSP	total suspended particulates
UACD	Utah Association of Conservation Districts
UBWR	Utah Board of Water Resources
UDA	Utah Department of Agriculture
UDEQ	Utah Department of Environmental Quality
UDNR	Utah Department of Natural Resources
UDOT	Utah Department of Transportation
UDWQ	Utah Division of Water Quality
UDWR	Utah Division of Wildlife Resources
UGS	Utah Geological Survey
UNEP	United Nations Environmental Programme
UNPS	Utah Native Plant Society
UP	Union Pacific
UREZ	Utah Renewable Energy Zone
USACE	U.S. Army Corps of Engineers
USC	*United States Code*
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
Utah DWR	Utah Division of Water Rights
UTTR	Utah Test and Training Range
UWS	Underground Water Storage, Savings and Replenishment Act
VACAR	Virginia-Carolinas Subregion
VCRS	Visual Contrast Rating System
VFR	visual flight rule
VOC	volatile organic compound
VRI	Visual Resource Inventory
VRM	Visual Resource Management
WA	Wilderness Area
WAPA	Western Area Power Administration
WECC	Western Electricity Coordinating Council
WECC CAN	Western Electricity Coordinating Council – Canada
WEG	wind erodibility group
WGA	Western Governors' Association

WGFD	Wyoming Game and Fish Department
WHA	wildlife habitat area
WHO	World Health Organization
WRAP	Water Resources Allocation Program; Western Regional Air Partnership
WRCC	Western Regional Climate Center
WREZ	Western Renewable Energy Zones
WRRI	Water Resources Research Institute
WSA	Wilderness Study Area
WSC	wildlife species of special concern
WSMR	White Sands Missile Range
WSR	Wild and Scenic River
WSRA	Wild and Scenic Rivers Act of 1968
WWII	World War II
YPG	Yuma Proving Ground
ZITA	zone identification and technical analysis
ZLD	zero liquid discharge

CHEMICALS

CH_4	methane	NO_2	nitrogen dioxide
CO	carbon monoxide	NO_x	nitrogen oxides
CO_2	carbon dioxide		
CO_2e	carbon dioxide equivalent	O_3	ozone
H_2S	hydrogen sulfide	Pb	lead
Hg	mercury		
		SF_6	sulfur hexafluoride
N_2O	nitrous oxide	SO_2	sulfur dioxide
NH_3	ammonia	SO_x	sulfur oxides

UNITS OF MEASURE

ac-ft	acre-foot (feet)	°F	degree(s) Fahrenheit
bhp	brake horsepower	ft	foot (feet)
		ft^2	square foot (feet)
°C	degree(s) Celsius	ft^3	cubic foot (feet)
cf	cubic foot (feet)		
cfs	cubic foot (feet) per second	g	gram(s)
cm	centimeter(s)	gal	gallon(s)
		GJ	gigajoule(s)
dB	decibel(s)	gpcd	gallon per capita per day
dBA	A-weighted decibel(s)	gpd	gallon(s) per day

gpm	gallon(s) per minute
GW	gigawatt(s)
GWh	gigawatt hour(s)
GWh/yr	gigawatt hour(s) per year
h	hour(s)
ha	hectare(s)
Hz	hertz
in.	inch(es)
J	joule(s)
K	degree(s) Kelvin
kcal	kilocalorie(s)
kg	kilogram(s)
kHz	kilohertz
km	kilometer(s)
km^2	square kilometer(s)
kPa	kilopascal(s)
kV	kilovolt(s)
kVA	kilovolt-ampere(s)
kW	kilowatt(s)
kWh	kilowatt-hour(s)
kWp	kilowatt peak
L	liter(s)
lb	pound(s)
m	meter(s)
m^2	square meter(s)
m^3	cubic meter(s)
mg	milligram(s)
Mgal	million gallons
mi	mile(s)
mi^2	square mile(s)
min	minute(s)
mm	millimeter(s)
MMt	million metric ton(s)
MPa	megapascal(s)
mph	mile(s) per hour
MW	megawatt(s)
MWe	megawatt(s) electric
MWh	megawatt-hour(s)
ppm	part(s) per million
psi	pound(s) per square inch
psia	pound(s) per square inch absolute
rpm	rotation(s) per minute
s	second(s)
scf	standard cubic foot (feet)
TWh	terawatt hours
VdB	vibration velocity decibel(s)
W	watt(s)
yd^2	square yard(s)
yd^3	cubic yard(s)
yr	year(s)
µg	microgram(s)
µm	micrometer(s)

ENGLISH/METRIC AND METRIC/ENGLISH EQUIVALENTS

The following table lists the appropriate equivalents for English and metric units.

Multiply	By	To Obtain
English/Metric Equivalents		
acres	0.004047	square kilometers (km^2)
acre-feet (ac-ft)	1,234	cubic meters (m^3)
cubic feet (ft^3)	0.02832	cubic meters (m^3)
cubic yards (yd^3)	0.7646	cubic meters (m^3)
degrees Fahrenheit (ºF) –32	0.5555	degrees Celsius (ºC)
feet (ft)	0.3048	meters (m)
gallons (gal)	3.785	liters (L)
gallons (gal)	0.003785	cubic meters (m^3)
inches (in.)	2.540	centimeters (cm)
miles (mi)	1.609	kilometers (km)
miles per hour (mph)	1.609	kilometers per hour (kph)
pounds (lb)	0.4536	kilograms (kg)
short tons (tons)	907.2	kilograms (kg)
short tons (tons)	0.9072	metric tons (t)
square feet (ft^2)	0.09290	square meters (m^2)
square yards (yd^2)	0.8361	square meters (m^2)
square miles (mi^2)	2.590	square kilometers (km^2)
yards (yd)	0.9144	meters (m)
Metric/English Equivalents		
centimeters (cm)	0.3937	inches (in.)
cubic meters (m^3)	0.00081	acre-feet (ac-ft)
cubic meters (m^3)	35.31	cubic feet (ft^3)
cubic meters (m^3)	1.308	cubic yards (yd^3)
cubic meters (m^3)	264.2	gallons (gal)
degrees Celsius (ºC) +17.78	1.8	degrees Fahrenheit (ºF)
hectares (ha)	2.471	acres
kilograms (kg)	2.205	pounds (lb)
kilograms (kg)	0.001102	short tons (tons)
kilometers (km)	0.6214	miles (mi)
kilometers per hour (kph)	0.6214	miles per hour (mph)
liters (L)	0.2642	gallons (gal)
meters (m)	3.281	feet (ft)
meters (m)	1.094	yards (yd)
metric tons (t)	1.102	short tons (tons)
square kilometers (km^2)	247.1	acres
square kilometers (km^2)	0.3861	square miles (mi^2)
square meters (m^2)	10.76	square feet (ft^2)
square meters (m^2)	1.196	square yards (yd^2)

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9.3 PISGAH

9.3.1 Background and Summary of Impacts

9.3.1.1 General Information

The proposed Pisgah SEZ has a total area of 23,950 acres (97 km^2) and is located in San Bernardino County in southeastern California, about 100 mi (160 km) northeast of Los Angeles (Figure 9.3.1.1-1). In 2008, the county population was 2,086,465. The nearest population center to the SEZ is the City of Barstow, which is located about 25 mi (40 km) to the west of the SEZ and had a 2008 population of 24,596. Interstate 40 (I-40) runs east–west through the proposed Pisgah SEZ, bisecting it into a northern portion that contains about two-thirds of the SEZ acreage and a southern portion with the remainder of the acreage. Access to the SEZ from I-40 is available from exits at Fort Cady Road (to the west of the SEZ), Hector Road (midway through the SEZ), and Pisgah Crater Road (at the eastern end of the SEZ). Hector Road runs north–south through the middle of the SEZ, and a number of other local dirt roads cross the SEZ. The National Trails Highway (historic U.S. 66) also passes through the SEZ as it runs south of and parallel to I-40. The BNSF Railroad serves the area and traverses the SEZ from the northwest to the southeast, running approximately parallel to and about 0.8 mi (1.3 km) north of I-40. Three small public airports are within about 62 mi (100 km) of the SEZ.

Four existing high-capacity transmission lines run from the southwest to the northeast through the eastern portion of the SEZ. It is assumed that these transmission lines could potentially provide access from the SEZ to the transmission grid (see Section 9.3.1.2). There are also other lower-capacity lines running through portions of the SEZ.

As of February 2010, there were two solar development applications with boundaries wholly or partially within the Pisgah SEZ. One of these, covering approximately 8,600 acres (35 km^2) of the SEZ, is a BLM fast-track project for which environmental reviews have begun.

The proposed Pisgah SEZ lies within the western Mojave Desert region of the Basin and Range physiographic province in southern California. The site is in a northwest–southeast trending valley that lies to the southeast of the Mojave Valley, between the Cady Mountains to the northeast and the Rodman and Lava Bed Mountains to the southwest. The SEZ has surface elevations ranging between 1,800 and 2,300 ft (549 and 701 m), with a general drainage pattern from east to west along the SEZ. The area is in the western portion of the Mojave Desert, which has an extremely arid climate marked by mild winters and hot summers and large daily temperature swings, with annual precipitation averaging about 3.8 in. (9.7 cm). Sediments of Troy Dry Lake make up about 8% of the west central portion of the SEZ.

The proposed Pisgah SEZ and other relevant information are shown in Figure 9.3.1.1-1. The criteria used to identify the SEZ as an appropriate location for solar development included proximity to existing transmission lines or designated corridors, proximity to existing roads, a

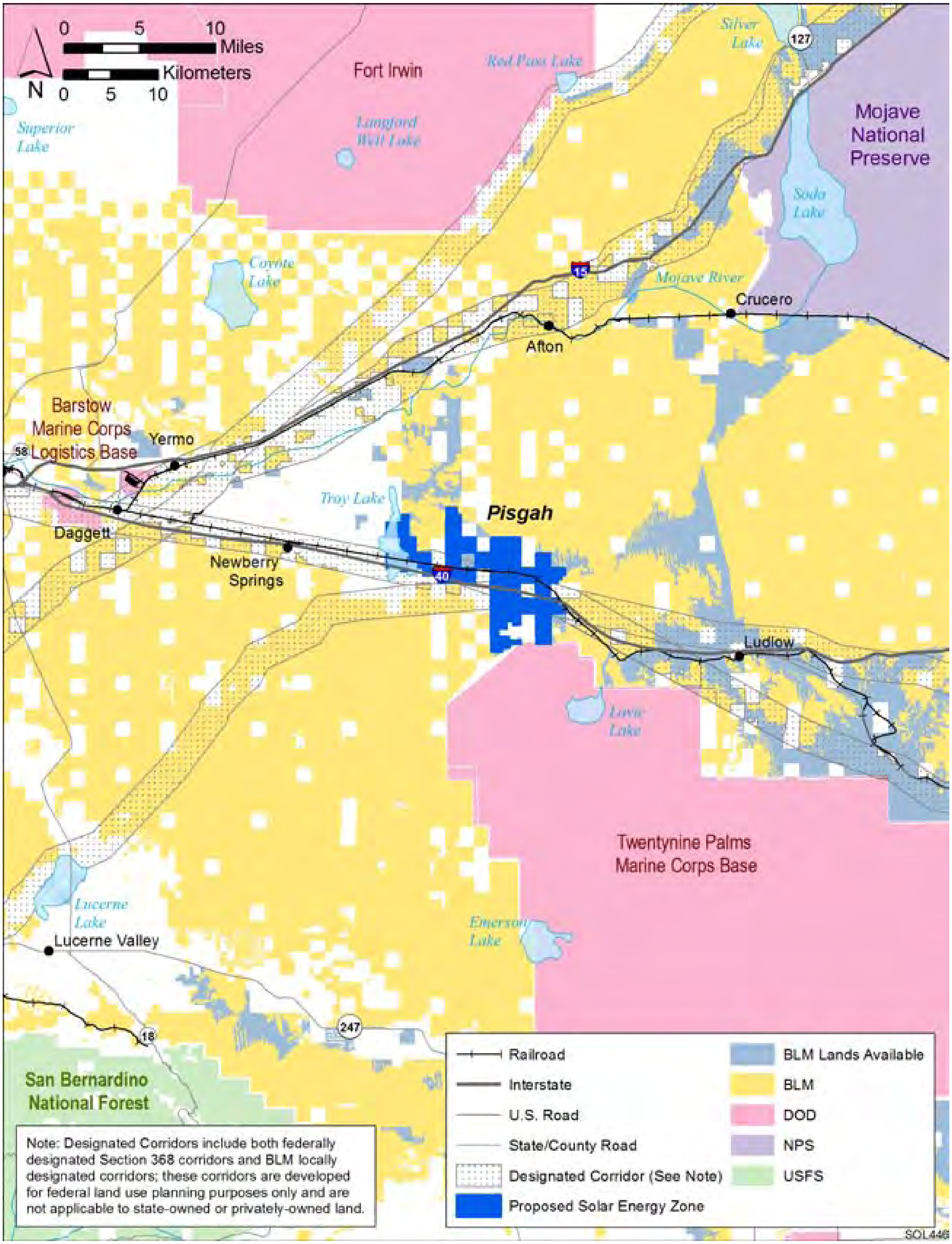

FIGURE 9.3.1.1-1 Proposed Pisgah SEZ

slope of generally less than 2%, and an area of more than 2,500 acres (10 km^2). In addition, the area was identified as being relatively free of other types of conflicts, such as USFWS-designated critical habitat for threatened and endangered species, ACECs, SRMAs, and NLCS lands (see Section 2.2.2.2 for the complete list of exclusions). Although these classes of restricted lands were excluded from the proposed Pisgah SEZ, other restrictions might be appropriate. The analyses in the following sections evaluate the affected environment and potential impacts associated with utility-scale solar energy development in the proposed SEZ for important environmental, cultural, and socioeconomic resources.

As initially announced in the *Federal Register* on June 30, 2009, the proposed Pisgah SEZ encompassed 26,282 acres (106 km^2). Subsequent to the study area scoping period, the Pisgah SEZ boundaries were altered somewhat for several reasons. Border areas with irregularly shaped boundaries were moved to match the section boundaries of the PLSS (BLM and USFS 2010a) to facilitate the BLM's administration of the SEZ area. Some small higher slope areas were also added to the borders of the SEZ acreage; although these higher slope areas would not be amenable to solar facilities, inclusion in the SEZ would facilitate BLM administration of the area. In addition, some lands near the Pisgah SEZ donated to the BLM for conservation purposes but inadvertently included in the published Pisgah study area were excluded from the boundaries of the SEZ. The revised SEZ is approximately 2,300 acres (9 km^2) smaller than the original SEZ as published in June 2009.

9.3.1.2 Development Assumptions for the Impact Analysis

Maximum development of the proposed Pisgah SEZ was assumed to be 80% of the total SEZ area over a period of 20 years, a maximum of 19,160 acres (78 km^2). These values are shown in Table 9.3.1.2-1, along with other development assumptions. Full development of the Pisgah SEZ would allow development of facilities with an estimated total of 2,129 MW of electrical power capacity if power tower, dish engine, or PV technologies were used, assuming 9 acres/MW (0.04 km^2/MW) of land required, and an estimated 3,832 MW of power if solar trough technologies were used, assuming 5 acres/MW (0.02 km^2/MW) of land required.

Availability of transmission from SEZs to load centers will be an important consideration for future development in SEZs. The nearest existing transmission lines are 230-kV and 250-kV lines that run through the SEZ. It is possible that these existing lines could be used to provide access from the SEZ to the transmission grid, but the 230- to 250-kV capacity of those lines would be inadequate for 2,129 to 3,832 MW of new capacity (a 500-kV line can accommodate approximately the load of one 700-MW facility). At full build-out capacity, it is clear that substantial new transmission and/or upgrades of existing transmission lines would be required to bring electricity from the proposed Pisgah SEZ to load centers; however, at this time the location and size of such new transmission facilities are unknown. Generic impacts of transmission and associated infrastructure construction and of line upgrades for various resources are discussed in Chapter 5. Project-specific analyses would need to identify the specific impacts of new transmission construction and line upgrades for any projects proposed within the SEZ.

TABLE 9.3.1.2-1 Proposed Pisgah SEZ Development Acreages, Maximum Solar MW Output, Access Roads, and Transmission Line ROWs

Total Acreage and Assumed Developed Acreage (80% of Total)	Assumed Maximum SEZ Output for Various Solar Technologies	Distance to Nearest State, U.S. or Interstate Highway	Distance and Capacity of Nearest Existing Transmission Line	Assumed Area of Transmission Line ROW and Road ROW	Distance to Nearest Designated Transmission Corridor[d]
23,950 acres and 19,160 acres[a]	2,129 MW[b] 3,832 MW[c]	Adjacent (I-40)	Within SEZ, 230 and 500 kV	0 acres and 0 acres	Within SEZ[e]

[a] To convert acres to km^2, multiply by 0.004047.

[b] Maximum power output if the SEZ were fully developed using power tower, dish engine, or PV technologies, assuming 9 acres/MW (0.04 km^2/MW) of land required.

[c] Maximum power output if the SEZ were fully developed using solar trough technologies, assuming 5 acres/MW (0.02 km^2/MW) of land required.

[d] BLM-designated corridors are developed for federal land use planning purposes only and are not applicable to state-owned or privately owned land.

[e] A Section 368 federally designated energy corridor crosses through the SEZ along I-40.

For the purposes of analysis in this PEIS, it was assumed that the four existing high-capacity transmission lines (230 and 500 kV) that run through the proposed Pisgah SEZ could provide access to the transmission grid, and thus no additional acreage disturbance for transmission line access was assessed. Access to the existing transmission lines was assumed, without additional information on whether these lines would be available to for connection of future solar facilities. If a connecting transmission line were constructed in the future to connect facilities within the SEZ to a different off-site grid location from the one assumed here, site developers would need to determine the impacts from the construction and operation of that line. In addition, developers would need to determine the impacts of line upgrades if they were needed.

Existing road access to the proposed Pisgah SEZ should be adequate to support construction and operation of solar facilities, because I-40 runs from east to west through the SEZ. Thus, no additional road construction outside of the SEZ is assumed to be required to support solar development of the SEZ.

9.3.1.3 Summary of Major Impacts and SEZ-Specific Design Features

In this section, the impacts and SEZ-specific design features assessed in Sections 9.3.2 through 9.3.21 for the proposed Pisgah SEZ are summarized in tabular form. The impacts identified in Table 9.3.1.3-1 are a comprehensive list of those discussed in these sections; the reader may reference the applicable sections for detailed support of the impact assessment.

TABLE 9.3.1.3-1 Summary of Impacts of Solar Energy Development within the Proposed Pisgah SEZ and SEZ-Specific Design Features[a]

Resource Area	Environmental Impacts—Proposed Pisgah SEZ	SEZ-Specific Design Features
Lands and Realty	Full development of the SEZ for utility-scale solar energy production (80% of the total area) could disturb up to 19,160 acres (77.5 km^2) and would establish a large industrial area that would exclude many existing and potential uses of the land, perhaps in perpetuity. Utility-scale solar energy development would introduce a new and discordant land use to the area.	None.
	Private lands and the state land parcel located on the boundaries of the SEZ also could be developed in the same or a complementary manner as the public lands if landowners agree and the lands are suitable for solar energy development.	None.
	The Section 368 energy corridor running through the SEZ could constrain solar development. Alternatively, the transmission corridor capacity could be substantially reduced if the SEZ were developed for utility-scale solar energy production.	None.
Specially Designated Areas and Lands with Wilderness Characteristics	Wilderness characteristics in 20% of the Cady Mountain WSA and 27% of the Rodman Mountain WA would be adversely affected. The Ord-Rodman DWMA and Pisgah ACECs abut portions of the Pisgah SEZ and are vulnerable to increased human traffic induced by the presence of the SEZ. The Rodman Mountains Cultural area would also be vulnerable to increased traffic.	Application of SEZ-specific design features for visual resource impacts may reduce the visual impact on wilderness characteristics. Once construction of solar energy facilities begins, the BLM would monitor to determine whether increases in traffic to the Ord-Rodman DWMA, Rodman Mountains Cultural Area, and Pisgah ACECs occur and whether additional management measures are required to protect the resources in these areas.

1

TABLE 9.3.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Pisgah SEZ	SEZ-Specific Design Features
Rangeland Resources: Livestock Grazing	None.	None.
Rangeland Resources: Wild Horses and Burros	None.	None.
Recreation	Recreation use would be excluded from developed portions of the SEZ but it is anticipated the loss of recreation use within the SEZ would be small. The presence of solar development in the SEZ also likely would adversely affect recreational use of the Cady Mountains WSA and Rodman Mountains WA. Opportunities for primitive recreation surrounding the SEZ would be reduced.	None.
Military and Civilian Aviation	The development of any solar energy or transmission facilities that encroach into the airspace of an MTR could interfere with military training activities and could create a safety concern.	None.
	The Barstow-Dagett public airport is located about 12 mi (19 km) west of the SEZ, but no impacts on operations at that airport are expected.	None.
Geologic Setting and Soil Resources	Impacts on soil resources would occur mainly as a result of ground-disturbing activities (e.g., grading, excavating, and drilling) during the construction phase. Impacts include soil compaction, soil horizon mixing, soil erosion and deposition by wind, soil erosion by water and surface runoff, sedimentation, and soil contamination. These impacts may be impacting factors for other resources (e.g., air quality, water quality, and vegetation). The Pisgah lava field may not be a suitable location for construction.	None. The feasibility of constructing solar facilities in the lava field area of the SEZ will need to be addressed by facility developers.

TABLE 9.3.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Pisgah SEZ	SEZ-Specific Design Features
Minerals (fluids, solids, and geothermal resources)	Currently there are 103 mining claims within the SEZ, most of these are in the area south of I-40, where there has been a mining operation for many years. These mining claims represent a prior existing right that, if valid, likely would preclude solar energy development as long as they are in place.	Consideration should be given to altering the boundaries of the SEZ to remove the areas with mining claims.
Water Resources	Ground-disturbance activities (affecting 17 to 25% of the total area in the peak construction year) could affect surface water quality due to surface runoff, sediment erosion, and contaminant spills. Construction activities may require up to 2,620 ac-ft (3.2 million m^3) of water during peak construction year. Construction activities would generate as much as 148 ac-ft 182,600 m^3) of sanitary wastewater. Assuming full development of the SEZ, normal operations would use the following amounts of water (Analysis Areas 1 and 2 combined): • For parabolic trough facilities (3,832-MW capacity), 2,736 to 5,802 ac-ft/yr (3.4 million to 7.2 million m^3/yr) for dry-cooled systems, and 19,214 to 57,534 ac-ft/yr (23.7 million to 71.0 million m^3/yr) for wet-cooled systems; • For power tower facilities (2,129-MW capacity), 1,514 to 3,217 ac-ft/yr (1.9 million to 4.0 million m^3/yr) for dry-cooled systems, and 10,668 to 31,957 ac-ft/yr (13.1 million to 39.4 million m^3/yr) for wet-cooled systems; • For dish engine facilities (2,129-MW capacity), 1,088 ac-ft/yr (1.3 million m^3/yr);	Water resource analysis indicates that wet-cooling options would not be feasible. Other technologies should incorporate water conservation measures. Land disturbance activities should avoid impacts to the extent possible in the vicinity of Troy Lake and ephemeral washes onsite. During site characterization, hydrologic investigations would need to identify 100-year floodplains and potential jurisdictional water bodies subject to Clean Water Act Section 404 permitting. Siting of solar facilities and construction activities should avoid areas identified as being within a 100-year floodplain. During site characterization, coordination and permitting with CDFG regarding California's Lake and Streambed Alteration Program would be required for any proposed alterations to surface water features (both perennial and ephemeral). Groundwater should be used in accordance with rules and regulations set forth by the MWA regarding the Mojave River adjudicated groundwater basin for the portions of the SEZ located in Analysis Area 1.

TABLE 9.3.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Pisgah SEZ	SEZ-Specific Design Features
Water Resources *(Cont.)*	• For PV facilities (2,129-MW capacity), 109 ac-ft/yr (134,400 m^3/yr). Assuming full development of the SEZ, normal operations would generate up to 54 ac-ft/yr (66,600 m^3/yr) of sanitary wastewater and up to 1,089 ac-ft/yr (1.3 million m^3/yr) of blowdown water. Approximately 20% of the SEZ is located within the Mojave River adjudicated groundwater basin, which is managed by the MWA: • Basin is fully allocated, and water-rights or water transfers would need to be negotiated with existing water rights holders and the MWA; • No exports of groundwater outside the MWA boundary is permitted.	The groundwater-permitting process should be in compliance with the San Bernardino County groundwater ordinance. Groundwater monitoring and production wells should be constructed in accordance with standards set forth by the State of California and San Bernardino County. Stormwater management best management practices should be implemented according to the California Stormwater Quality Association. Water for potable uses would have to meet or be treated to meet water quality standards in the California Safe Drinking Water Act.
Vegetation[b]	Approximately 80% of the SEZ (19,160 acres [77.5 km^2]) would be cleared with full development of the SEZ. The plant communities affected would depend on facility locations and could include any of the plant communities occurring on the SEZ. Therefore, for the purposes of this analysis, all of the area of each cover type within the SEZ is considered to be directly affected by removal with full development of the SEZ. Sand dune, playa, desert chenopod scrub, and dry wash communities are important sensitive habitats within the SEZ that could be affected. Indirect effects (caused, for example, by surface runoff or dust from the SEZ) outside the SEZ boundaries would have the potential to degrade	An Integrated Vegetation Management Plan, addressing invasive species control, and an Ecological Resources Mitigation and Monitoring Plan, addressing habitat restoration should be approved and implemented to increase the potential for successful restoration of creosotebush–white bursage desertscrub communities and other affected habitats and to minimize the potential for the spread of tamarisk, Sahara mustard, schismus, or other invasive species. Invasive species control should focus on biological and mechanical methods to reduce the use of herbicides.

TABLE 9.3.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Pisgah SEZ	SEZ-Specific Design Features
Vegetation[b] *(Cont.)*	affected plant communities and reduce biodiversity by promoting the decline or elimination of species sensitive to disturbance. Indirect effects could also cause an increase in disturbance-tolerant species or invasive species. Noxious weeds could become established in disturbed areas and colonize adjacent undisturbed habitats, thus causing reduced restoration success and possible widespread habitat degradation. Groundwater withdrawals could affect riparian areas or groundwater-dependent communities, such as mesquite bosque.	All playa, chenopod scrub, sand dune and sand transport areas, and desert dry wash habitats, shall be avoided to the extent practicable, and any impacts minimized and mitigated. A buffer area shall be maintained around riparian areas, playas, and dry washes to reduce the potential for impacts on these habitats on or near the SEZ. Appropriate engineering controls shall be used to minimize impacts on these areas resulting from surface water runoff, erosion, sedimentation, altered hydrology, accidental spills, or fugitive dust deposition to these habitats. Appropriate buffers and engineering controls would be determined through agency consultation. Groundwater withdrawals should be prohibited to avoid the potential for indirect impacts on riparian habitat along the Mojave River or groundwater-dependent communities, such as mesquite bosque.
Wildlife: Amphibians and Reptiles[b]	The red-spotted toad (*Bufo punctatus* would be expected to occur within the Pisgah SEZ. However, as it prefers dry, rocky areas near temporary sources of standing water, its occurrence within the SEZ would be spatially limited. It would most likely occur in the far western portion of the SEZ that overlaps portions of Troy Lake. Thirty-one reptile species (the desert tortoise, which is a federally and state-listed species; 13 lizards; and 16 snakes) could occur within the SEZ.	Implement design features to reduce the potential for effects on amphibians and reptiles, especially for those species that depend on habitat types that can be avoided (e.g., Troy Lake, which could provide habitat for the red-spotted toad).

TABLE 9.3.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Pisgah SEZ	SEZ-Specific Design Features
Wildlife: Amphibians and Reptiles[b] *(Cont.)*	Direct impacts on amphibian and reptile species from SEZ development would be small (0.2 to 0.6% of potentially suitable habitats identified for the species in the SEZ region would be lost). With implementation of proposed design features, indirect impacts would be expected to be negligible.	
Wildlife: Birds[b]	Almost 100 species of birds have a range that encompasses the Pisgah SEZ region. However, habitats for more than 35 of these species either do not occur on or are limited within the SEZ (e.g., habitat for waterfowl and wading birds). Direct impacts on bird species would be small for most bird species (0.6% or less of habitats potentially suitable for most representative bird species would be lost), although a moderate impact is indicated for the killdeer (1.7% of its potentially suitable habitat would be lost). Other impacts on birds could result from collision with vehicles and facility structures, surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, noise, lighting, spread of invasive species, accidental spills, and harassment. Indirect impacts on areas outside the SEZ (for example, impacts caused by dust generation, erosion, and sedimentation) are expected to be negligible with implementation of proposed design features.	Pre-disturbance surveys should be conducted within the SEZ for desert bird focal species and bird species listed under the Migratory Bird Treaty Act. Impacts on potential nesting habitat for these species should be avoided during the nesting season. Plant species that positively influence the presence and abundance of the desert bird focal species should be avoided to the extent practicable. These species include Goodding's willow, yucca, Joshua tree, mesquite, honey mesquite, screwbean, desert mistletoe, big saltbush, smoketree, and catclaw acacia. Take of golden eagles and other raptors should be avoided. Development within the area of Troy Lake should be avoided.

TABLE 9.3.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Pisgah SEZ	SEZ-Specific Design Features
Wildlife: Mammals[b]	Direct impacts on small game, furbearers, and small mammals on the SEZ from habitat disturbance and long-term habitat reduction/fragmentation would be small (0.6% or less of potentially suitable habitats for the species in the SEZ region would be lost). Other impacts on mammals could result from collision with vehicles and fences, surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, noise, lighting, spread of invasive species, accidental spills, and harassment. Indirect impacts on areas outside the SEZ (e.g., impacts caused by dust generation, erosion, and sedimentation) are expected to be negligible with implementation of proposed design features.	Development within the ephemeral drainages should be avoided in order to reduce impacts on species such as the round-tailed ground squirrel, white-tailed antelope squirrel, little pocket mouse, long-tailed pocket mouse, and any other mammal species that inhabit wash habitats.
Aquatic Biota[b]	No permanent water bodies, perennial streams, or wetlands are present within the boundaries of the Pisgah SEZ or within the 5-mi (8-km) area considered potentially susceptible to indirect impacts. Consequently, no direct or indirect impacts on aquatic habitats are expected to occur from construction and operation of utility-scale solar energy facilities at the Pisgah SEZ. However, more site specific data would be necessary to evaluate whether aquatic biota is present in ephemeral surface water features. Water quantity in surrounding aquatic habitats could be affected if significant amounts of surface water or groundwater were utilized for solar development needs.	None.

TABLE 9.3.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Pisgah SEZ	SEZ-Specific Design Features
Special Status Species[b]	Potentially suitable habitat for 54 special status species occurs in the affected area of the Pisgah SEZ. For most of these special status species, less than 1% of the potentially suitable habitat in the region occurs in the area of direct effects; for all special status species, less than 3% of the potentially suitable habitat in the region occurs in the area of direct effects. There are three groundwater dependent species that occur outside of the areas of direct and indirect effects. Potential impacts on these species could range from small to large depending on the solar energy technology deployed, the scale of development within the SEZ, and the cumulative rate of groundwater withdrawals.	Pre-disturbance surveys should be conducted within the SEZ to determine the presence and abundance of special status species. Disturbance to occupied habitats for these species should be avoided or minimized to the extent practicable. If avoiding or minimizing impacts to occupied habitats is not possible for some species, translocation of individuals from areas of direct effect; or compensatory mitigation of direct effects on occupied habitats could reduce impacts. A comprehensive mitigation strategy for special status species that used one or more of these options to offset the impacts of development should be developed in coordination with the appropriate federal and state agencies. Disturbance of desert playa and wash habitats within the SEZ should be avoided or minimized to the extent practicable. In particular, development should be avoided in and near Troy Lake in the western portion of the SEZ. Avoiding or minimizing disturbance of these habitats could reduce impacts on 11 special status species. Avoiding or minimizing disturbance of sand dunes and sand transport systems, rocky cliffs, and outcrops on the SEZ could reduce impacts on 11 special status species. Avoiding or minimizing groundwater withdrawals from the SEZ would reduce or prevent impacts on 3 special status species that may occur in aquatic habitats outside of the affected area.

TABLE 9.3.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Pisgah SEZ	SEZ-Specific Design Features
Special Status Species[b] *(Cont.)*		As a California fully protected species, direct and indirect impacts on the Mohave tui chub should be completely avoided. This includes the avoidance of groundwater withdrawals from the SEZ that may affect habitats at Camp Cady and in the Mojave River. Coordination with the CDFG should be conducted for the Mohave tui chub to address the potential for impact when project-related groundwater demands are better identified. Consultations with the USFWS and the CDFG should be conducted to address the potential for impacts on the Mohave tui chub and desert tortoise species listed as endangered and threatened, respectively, under the ESA and CESA. Consultation would identify an appropriate survey protocol, avoidance measures, and, if appropriate, reasonable and prudent alternatives, reasonable and prudent measures, and terms and conditions for incidental take statements. Harassment or disturbance of special status species and their habitats in the affected area should be mitigated. This can be accomplished by identifying any additional sensitive areas and implementing necessary protection measures based upon consultation with the USFWS and CDFG.

TABLE 9.3.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Pisgah SEZ	SEZ-Specific Design Features
Air Quality and Climate	*Construction*: Temporary exceedances of AAQS for PM_{10} and $PM_{2.5}$ at the SEZ boundaries during construction; higher concentrations would be limited to the immediate area surrounding the SEZ boundary and would decrease quickly with distance. Modeling indicates that emissions from construction activities are not expected to exceed Class I PSD PM_{10} increments at the nearest Federal Class I area (Joshua Tree NP). Construction emissions from the engine exhaust from heavy equipment and vehicles could cause some impacts on AQRVs (e.g., visibility and acid deposition) at the nearest federal Class I area. *Operations:* Positive impact due to avoided emission of air pollutants from combustion-related power generation: 3.5 to 6.3% of total SO_2, NO_x, Hg, and CO_2 emissions from electric power systems in the state of California avoided (up to 858 tons/yr SO_2, 1,410 tons/yr NO_x, 0.012 tons/yr Hg, and 3,336,000 tons/yr CO_2).	None.
Visual Resources	Large visual impacts on the SEZ and surrounding lands within the SEZ viewshed due to major modification of the character of the existing landscape; potential additional impacts from construction and operation of transmission lines and access roads within the SEZ. The SEZ is located within the CDCA. While renewable energy development is allowable within the SEZ under the CDCA management plan, substantial, non-mitigable visual impacts would occur within the CDCA in the SEZ and surrounding lands. The SEZ is located 6.0 mi (9.7 km) from the Newberry Mountains WA. Because of the open views of the SEZ and elevated viewpoints, weak to moderate visual contrasts could be observed by WA visitors.	Within the SEZ, in areas visible from and within 1 mi (1.6 km) of the Cady Mountains WSA, visual impacts associated with solar energy project operation should be consistent with VRM Class II management objectives, as experienced from KOPs (to be determined by the BLM) within the WSA, and in areas visible from between 1 and 3 mi (1.6 and 4.8 km); visual impacts should be consistent with VRM Class III management objectives. Within the SEZ, in areas located south of I-40 and visible from and between 1 and 3 mi (1.6 and 4.7 km) of the Rodman Mountains WA, visual impacts associated with solar energy project operation should be consistent with VRM Class III management objectives, as experienced from KOPs determined by the BLM within the WA.

TABLE 9.3.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Pisgah SEZ	SEZ-Specific Design Features
Visual Resources *(Cont.)*	The SEZ is located 1.2 mi (1.9 km) from the Rodman Mountains WA. Because of the short distance and elevated viewpoints, moderate to strong visual contrasts could be observed by WA visitors. The SEZ is adjacent to the Cady Mountains WSA. Because of the short distance and elevated viewpoints, moderate to strong visual contrasts could be observed by WSA visitors. Approximately 48 mi (77 km) of I-40 and Historic Route 66 are within the SEZ viewshed. Eight mi (13 km) of I-40 and 5 mi (8 km) of Historic Route 66 are within the SEZ. Strong visual contrasts could be observed within the SEZ by travelers on both roads. Amtrak passenger rail line serves Barstow and travels through the SEZ on BNSF tracks for approximately 9 mi (15 km). Approximately 55 mi (88 km) of the passenger service line are within the SEZ viewshed. Strong visual contrasts could be observed within the SEZ by train passengers. The communities of Barstow, Daggett, Yermo, Newberry Springs, and Ludlow are located within the viewshed of the SEZ, although slight variations in topography and vegetation provide some screening. Moderate visual contrasts may be observed within Newberry Springs. Residents, workers, and visitors to the area may experience visual impacts from solar energy facilities located within the SEZ (as well as any associated access roads and transmission lines) as they travel area roads, including I-15. Nearby residents could be subjected to large visual impacts from solar energy development within the SEZ.	

TABLE 9.3.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Pisgah SEZ	SEZ-Specific Design Features
Acoustic Environment	*Construction*. Estimated noise levels at the nearest residence located next to the northwestern corner of the SEZ would be about 74 dBA, which is much higher than a typical daytime mean rural background level of 40 dBA and the San Bernardino County regulation of 55 dBA daytime L_{eq} For 10-hr daytime work schedule, about 70 dBA L_{dn} would be above the EPA guideline of 55 dBA L_{dn} for residential areas. *Operations*. Noise levels at the nearest residence from a CSP solar facility would be about 51 dBA, which is higher than typical daytime mean rural background level of 40 dBA but lower than the San Bernardino County regulation of 55 dBA daytime L_{eq}. For 12-hour daytime operation, the estimated 49 dBA L_{dn} falls below the EPA guideline of 55 dBA L_{dn} for residential areas. However, in the case of 6-hour TES, the estimated nighttime noise level at the nearest residence would be 61 dBA, which is higher than typical nighttime mean background level of 30 dBA and San Bernardino County regulation of 45 dBA nighttime L_{eq}. The day–night average noise level is estimated to be about 63 dBA L_{dn}, which is higher than the EPA guideline of 55 dBA L_{dn}, for residential areas. If 80% of the SEZ were developed with dish engine facilities, the estimated noise level of 56 dBA at the nearest residence would be higher than a typical daytime mean rural background level of 40 dBA and slightly higher than the San Bernardino County regulation of 55 dBA daytime $L_{eq.}$ For 12-hour daytime operations, the estimated 54 dBA L_{dn} would be just below the EPA guideline of 55 dBA L_{dn} for residential areas. About 3-dBA higher noise levels than those at the nearest residence were predicted at the next nearest residence (about 500 ft [150 m] south of the SEZ near I-40), but these noise levels are considerably masked by heavy road traffic noise from I-40.	Noise levels from cooling systems equipped with TES should be managed so that levels at the nearby residences to the northwest and to the south of the SEZ are kept within applicable guidelines. This could be accomplished in several ways, for example, through placing the power block approximately 1 to 2 mi (1.6 to 3 km) or more from residences, limiting operations to a few hours after sunset, and/or installing fan silencers. Dish engine facilities within the Pisgah SEZ should be located more than 1 to 2 mi (1.6 to 3 km) from the nearest residences to the northwest and the south of the SEZ (i.e., the facilities should be located in other portions of the proposed SEZ). Direct noise control measures applied to individual dish engine systems could also be used to reduce noise impacts at the nearest residences.

TABLE 9.3.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Pisgah SEZ	SEZ-Specific Design Features
Paleontological Resources	The potential for impacts on significant paleontological resources at the SEZ is relatively unknown, but could be high in some areas. A more detailed investigation of the local geological deposits of the SEZ and their potential depth is needed; a paleontological survey would likely be required prior to project approval.	The need for and the nature of any SEZ-specific design features would depend on findings of paleontological surveys.
Cultural Resources	Direct impacts on significant cultural resources could occur in the proposed Pisgah SEZ; however, a cultural resource survey of the entire area of potential effect of a proposed project would first need to be conducted to identify archaeological sites, historic structures and features, and traditional cultural properties, and an evaluation would then be needed to determine whether any are eligible for listing in the NRHP. Numerous prehistoric and Native American sites and trails are potentially located within the SEZ and could be impacted by solar energy development.	Significant historic and prehistoric sites in the vicinity of Troy Lake should be avoided. Areas of significant prehistoric remains within the SEZ that are identified through the Calico Solar Power Project (to date an area including a 400 ft [122 m] buffer and in some instances fencing [BLM and CA SHPO 2010]) should be avoided. Other possible design features specific to the SEZ would be determined through consultation with the California SHPO and affected Tribes.
Native American Concerns	Development of utility-scale solar energy projects in the SEZ could have direct impacts on resources important to Native Americans. The proposed Pisgah SEZ is located close to the Mohave Trail and may be visible from it. The SEZ includes plant species important to Native American, but not in abundance. There is also some potential for game animals important to Native Americans, including bighorn sheep crossing from surrounding mountains, and smaller game such as black-tailed jackrabbits. Ground-disturbing activities have the potential for adversely affecting these resources along with archaeological resources and burials important to Native Americans. As consultations continue, it is possible that other Native American concerns, regarding solar energy development within the SEZ will emerge.	The need for and nature of SEZ-specific design features would be determined during government-to-government consultation with the affected Tribes.

TABLE 9.3.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Pisgah SEZ	SEZ-Specific Design Features
Socioeconomics	*Construction:* 806 to 10,667 total jobs; $66 million to $871 million income in ROI. *Operations:* 58 to 1,385 annual total jobs; $2.4 million to $61 million annual income in the ROI.	None.
Environmental Justice	There are both minority populations and low-income populations, as defined by CEQ guidelines, within the 50-mi (80-km) radius around the boundary of the SEZ, meaning that any adverse impacts of solar projects could disproportionately affect minority and low-income populations.	None.
Transportation	The primary transportation impacts are anticipated to be from commuting worker traffic. I-40 and the National Trails Highway provide a regional traffic corridor that would experience small impacts for single projects that may have up to 1,000 daily workers, with an additional 2,000 vehicle trips per day (maximum). Such an increase is approximately 15% of the current traffic on I-40. The exits on I-40 might experience moderate impacts with some congestion.	None.

Abbreviations: AAQS = ambient air quality standards; ACEC = Area of Critical Environmental Concern; AQRV = air quality-related value; BLM = Bureau of Land Management; BMP = best management practice; BNSF = Burlington Northern Santa Fe; CDCA = California Desert Conservation Area; CDFG = California Department of Fish and Game; CEQ = Council on Environmental Quality; CESA= California Endangered Species Act; CNDDB = California Natural Diversity Database; CO_2 = carbon dioxide; CRA = Colorado River Aqueduct; CSP = concentrating solar power; DWMA = Desert Wildlife Management Area; EPA = U.S. Environmental Protection Agency; ESA = Endangered Species Act; Hg = mercury; KOP = key observation point; MTR = military training route; MWA = Mojave Water Agency; NO_x = nitrogen oxides; NRHP = *National Register of Historic Places*; $PM_{2.5}$ = particulate matter with an aerodynamic diameter of 2.5 μm or less; PM_{10} = particulate matter with an aerodynamic diameter of 10 μm or less; PSD = prevention of significant deterioration; PV= photovoltaic; ROI = region of influence; SEZ = solar energy zone; SHPO = State Historic Preservation Office; SO_2 = sulfur dioxide; TES = thermal energy storage; USFWS = U.S. Fish and Wildlife Service; VOC = volatile organic compound; VRM = visual resource management; WA = Wilderness Area; WSA = Wilderness Study Area**.**

[a] The detailed programmatic design features for each resource area to be required under BLM's Solar Energy Program are presented in Appendix A, Section A.2.2. These programmatic design features would be required for development in the proposed Pisgah SEZ.

[b] The scientific names of all plants, wildlife, aquatic biota, and special status species are provided in Sections 9.3.10 through 9.3.12.

Section 9.3.22 discusses potential cumulative impacts from solar development in the proposed SEZ.

Only those design features specific to the Pisgah SEZ are included in Sections 9.3.2 through 9.3.21 and in the summary table. The detailed programmatic design features for each resource area to be required under BLM's Solar Energy Program are presented in Appendix A, Section A.2.2. These programmatic design features would also be required for development in this and other SEZs.

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9.3.2 Lands and Realty

9.3.2.1 Affected Environment

The 23,950 acres (97 km^2) of the proposed Pisgah SEZ stretch for about 12 mi (19 km) along I-40, which splits the SEZ into northern and southern portions. Although the SEZ consists only of BLM-administered public lands, the combination of the public land ownership pattern and the topography of the area creates a large interface between public and private lands. There are also about 380 acres (1.5 km^2) of state land bordering the SEZ. There is a large block of private land to the west and northwest of the area. The area is rural in character.

There are numerous existing ROW authorizations in the SEZ (BLM and USFS 2010b), including authorizations for I-40 and the National Trails Highway (old U.S. 66), a railroad line, a fiber optic line, four large transmission lines, an electrical substation, four pipelines, and a county road that provides access to a mine surrounded by the SEZ. There are also additional lower capacity power lines located in portions of the SEZ. A 2-mi (3-km) wide Section 368 designated energy corridor that follows the route of I-40 passes through portions of the SEZ. This corridor was recently established as an outcome of the West-wide Corridor PEIS (DOE and DOI 2008) (see also Section 3.2.5).

As of February 2010, there were two solar development applications wholly or partially within the SEZ boundaries. One of these, covering approximately 8,600 acres (35 km^2) of the SEZ, is a BLM fast-track project for which environmental reviews have begun.

9.3.2.2 Impacts

9.3.2.2.1 Construction and Operations

Development of the proposed Pisgah SEZ for utility-scale solar energy production would establish a very large industrial area that would exclude many existing and potential uses of the land, perhaps in perpetuity. Since the SEZ is relatively undeveloped and rural, utility-scale solar energy development would be a new and discordant land use in the area. It is also possible that the numerous private lands and the state land parcel located on the boundaries of the SEZ could be developed in the same or a complementary manner as the public lands if the landowners are willing and if these lands are suitable for solar energy development.

Existing ROW authorizations on the SEZ would not be affected by solar energy development since they are prior rights. The existing pipeline, electrical transmission line, and highway ROWs do remove some land from potential solar development within the SEZ. Should the proposed SEZ be identified as an SEZ in the ROD for this PEIS, the BLM would still have discretion to authorize additional ROWs in the area until solar energy development was authorized, and then future ROWs would be subject to the rights granted for solar energy development.

The designated Section 368 transmission corridor along I-40 running through portions of the SEZ could limit solar development of the SEZ, because in order to avoid technical or operational interference between transmission and solar energy facilities, solar energy facilities cannot be constructed under transmission lines or over pipelines. Alternatively, because of the existing constraints from designated WAs, one WSA, the Twentynine Palms Marine Base, and topographic constraints, the transmission corridor capacity could be substantially reduced if the SEZ were fully developed for utility-scale solar energy production. Transmission capacity is becoming a more critical factor and reducing corridor capacity in this SEZ may have future, but currently unknown, consequences. This is an administrative conflict that can be addressed by the BLM, but there would be implications either for the amount of potential solar energy development or for the amount of transmission capacity that can be accommodated.

The current public land ownership pattern, along with terrain features in the SEZ, could lead to the creation of isolated parcels of BLM-administered land scattered among solar energy facilities that would be both inaccessible to the public and difficult to manage.

9.3.2.2.2 Transmission Facilities and Other Off-Site Infrastructure

An existing 230-kV transmission line runs north–south through the eastern portion of the SEZ; this line might be available to transport the power produced in this SEZ. Establishing a connection to the existing line would not involve the construction of a new transmission line outside of the SEZ. If a connecting transmission line were constructed in a different location outside of the SEZ in the future, site developers would need to determine the impacts from construction and operation of that line. In addition, developers would need to determine the impacts of line upgrades, if they were needed.

Road access to the SEZ is readily available, so it is anticipated there would be no additional land disturbance outside the SEZ associated with road construction to provide access to the SEZ. Both internal electric transmission lines and roads would be required to support development of solar energy facilities. See Section 9.3.1.2 for the analysis assumptions for the SEZ.

9.3.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features were identified. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM’s Solar Energy Program would provide adequate mitigation for some identified impacts. The exceptions may be impacts that are related to the exclusion of many existing and potential uses of the public land, perhaps in perpetuity; the visual impact of an industrialized-looking solar facility within an otherwise rural area; and induced land use changes on state and private lands.

9.3.3 Specially Designated Areas and Lands with Wilderness Characteristics

9.3.3.1 Affected Environment

The SEZ is located in the California Desert Conservation Area (CDCA) which is a 26-million-acre (105,000-km^2) area in southern California designated by Congress in 1976 in the FLPMA. About 10.7 million acres (43,300 km^2) of the CDCA are administered by the BLM. The proposed Pisgah SEZ is located within the CDCA and is surrounded by specially designated areas, including four designated WAs, one WSA, and numerous ACECs (Figure 9.3.3.1-1). None of the ACECs within the viewshed of the SEZ were designated because they possess scenic values; they were identified for the protection of plant and animal species or cultural resources. No lands with wilderness characteristics outside of designated WAs or WSAs have been identified within 25 mi (40 km) of the SEZ.

As part of the planning process for the BLM-administered lands in the CDCA, all public lands except for about 300,000 acres (1,214 km^2) of scattered parcels were designated geographically into one of four multiple-use classes. The classification was based on the sensitivity of resources and kinds of uses for each geographic area. The four multiple-use classes are (BLM 1999):

- Class C is for lands either designated as wilderness or for wilderness study areas. These lands are managed to protect their wilderness characteristics.

- Class L (Limited Use) protects sensitive, natural, scenic, ecological, and cultural resource values. Public lands designated as Class L are managed to provide for generally lower intensity, carefully controlled multiple use of resources, while ensuring that sensitive values are not significantly diminished.

- Class M (Moderate Use) is based upon a controlled balance between higher intensity use and protection of public lands. This class provides for a wide variety of present and future uses such as mining, livestock grazing, recreation, energy, and utility development. Class M management is also designed to conserve desert resources and to mitigate damage to those resources caused by permitted uses.

- Class I (Intensive use) is to provide for concentrated use of lands and resources to meet human needs. Reasonable protection will be provided for sensitive natural and cultural values. Mitigation of impacts on resources and rehabilitation of affected areas will occur insofar as possible.

Land within the SEZ south of I-40 is predominantly Class L (27%), and the rest of the area is Class M (73%). The Multiple Use Class Guidelines contained in the CDCA Plan indicate that wind, solar, or geothermal electrical generation facilities could be allowed in both of these classes.

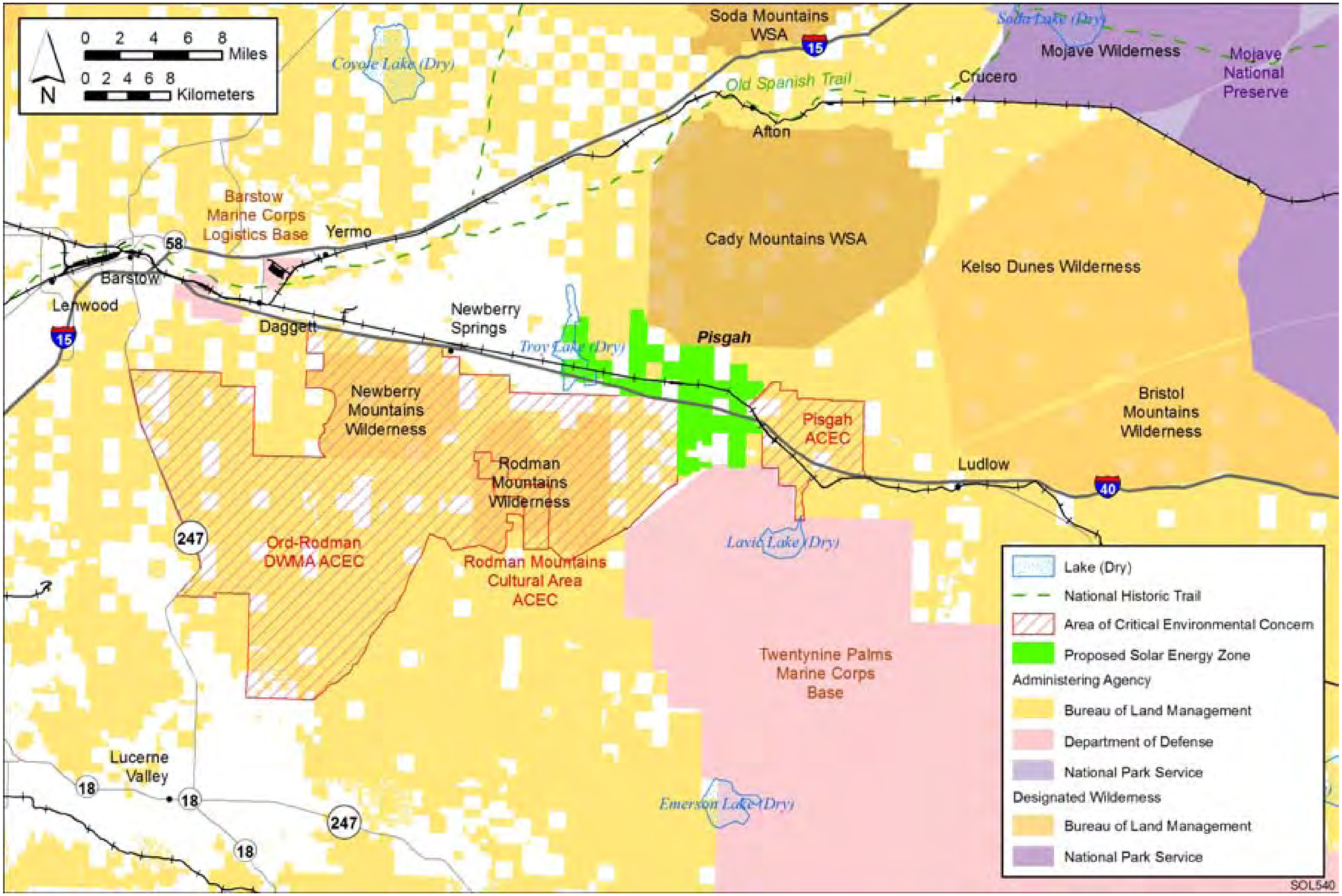

FIGURE 9.3.3.1-1 Specially Designated Areas in the Vicinity of the Proposed Pisgah SEZ

9.3.3.2 Impacts

9.3.3.2.1 Construction and Operations

The potential impact on specially designated areas from solar development within the proposed Pisgah SEZ is difficult to quantify and would vary by solar technology employed, the specific area being affected, and the perception of individuals viewing the development. Development of the SEZ, especially full development, would be a dominating factor in the viewshed from large portions of some of these specially designated areas, as summarized in Table 9.3.3.2-1. The data provided in Table 9.3.3.2-1 assume the use of the power tower solar energy technology, which because of the potential height of these facilities could be visible from the largest amount of land for the technologies being considered in this PEIS. The potential visual impacts of solar energy projects in terms of the amount of acreage within specially designated areas within the viewshed of the SEZ could be less for shorter solar energy facilities; however, assessment of the visual impact of solar development on specially designated areas must be conducted on a site-specific and technology-specific basis to accurately identify impacts. See Section 9.3.14 for a more complete review of the visual impacts for the Pisgah SEZ. The nine ACECs presented in Table 9.3.3.2-1, with the exception of the Ord-Rodman DWMA, Rodman Mountains Cultural Area, and Pisgah, are presented for information only and are not analyzed further. They were not analyzed because they do not have a scenic component for their designation and they are far enough removed from the SEZ that they would not reasonably be expected to have an increase in human use and traffic because of construction and operation of solar energy facilities in the SEZ.

In general, the closer a viewer is to solar development, the greater the potential impact is on an individual's perception of impact on the values within the area from which the individual is viewing the SEZ. The viewing height above a solar energy development area, the size of the development area, and the purpose for which a person is visiting an area are also important. Individuals seeking a wilderness experience within these areas could be expected to be more adversely affected than those traveling along the highway with another destination in mind. In the case of the Pisgah SEZ, the low-lying location of the SEZ in relation to surrounding specially designated areas would tend to highlight the industrial-like development in the SEZ. Because the SEZ currently has numerous man-made features present, the impact on wilderness characteristics and scenic values may be less significant than in areas that are more pristine.

The occurrence of glint and glare at solar facilities could potentially cause large, but temporary, increases in brightness and visibility of the facilities. The visual contrast levels that were assumed to assess potential impacts on specially designated areas (see Section 9.3.14) do not account for potential glint and glare effects; however, these effects would be incorporated into a future site- and project-specific assessment that would be conducted for specific proposed utility-scale solar energy projects.

TABLE 9.3.3.2-1 Specially Designated Areas Potentially within the Viewshed of Solar Facilities within the Proposed Pisgah SEZ[a]

Name	Total Acres	Acres within 5-mi (8-km) Viewshed	Percent within 5-mi (8-km) Viewshed	Acres within 15-mi (24-km) Viewshed	Percent within 15-mi (24-km) Viewshed	Acres within 25-mi (40-km) Viewshed	Percent within 25-mi (40-km) Viewshed
California Desert Conservation Area	25,919,319	178,231	7	406,533	1.6	552,338	2.1
Calico Early Man Site ACEC[b]	899			684	76.1	684	76.1
Manix ACEC[b]	2,259			894	39.6	894	39.6
Mojave Fringe-toed Lizard ACEC[b]	24,695			2,728	11.0	3,411	13.8
Mojave Monkeyflower ACEC[b]	46,488			263	0.6	9,988	21.5
Ord-Rodman DWMA ACEC	224,622	35,353	15.7	63,990	28.5	65,372	29.1
Parish's Phacelia ACEC[b]	899			873	97.2	873	97.2
Pisgah ACEC	19,755	14,792	74.9	16,429	83.2	16,429	83.2
Rodman Mountains Cultural Area ACEC	6,208			1,944	31.3	1,944	31.3
Superior-Cronese ACEC[b]	542,739			58,114	10.7	135,987	25.1
Old Spanish National Historic Trail	17,362			161	0.9	190	1.1
Bristol Mountains WA	77,026			1,776	2.3	8,353	10.8
Kelso Dunes WA	154,335			694	0.4	4,383	2.8
Newberry Mountains WA	27,768			6,498	23.4	6,498	23.4
Rodman Mountains WA	34,341	9,120	26.6	19,900	57.9	19,900	57.9
Cady Mountains WSA	120,197	20,677	17.2	23,952	19.9	23,952	19.9
Soda Mountains	121,680					3,005	2.5

[a] Identified assuming a power tower facility of 650 ft (198.1 m).

[b] Denotes area not further discussed in the text.

Cady Mountains WSA and Rodman Mountains and Newberry Mountains Wilderness

- The southwestern side of the Cady Mountains WSA[1] abuts the SEZ and rises quickly above it, providing a dominating view of the SEZ. Visitors in about 24,000 acres (97 km^2), or 20% of the WSA, would have a clear view of the development in the SEZ. It is likely that much of the wilderness value of this portion of the WSA would be adversely affected by development within the SEZ. The viewshed of the WSA includes I-40 and the railroad, which are within 3 to 4 mi (5 to 6 km) of the WSA boundary; therefore the impact of SEZ development on the wilderness characteristics of the WSA may be less significant than in the case of a pristine viewshed.

- A total of about 58% of the designated Rodman Mountains Wilderness would have a full view of solar development in the SEZ. Within 5 mi (8 km) of the SEZ, because of the strong contrast between solar development and the surrounding area, wilderness characteristics would be adversely affected in areas in view of the SEZ. This area includes 9,000 acres (36 km^2), or about 27% of the WA. Beyond 5 mi (8 km), while the SEZ would still be very visible, visual impacts would begin to diminish because of increasing distance and the smaller percentage of the overall viewshed covered by the SEZ. Views from within the WA currently include I-40, old U.S. 66, and four electrical transmission lines on the southeastern side of the SEZ. Because of the presence of these features, the impact of development within the SEZ on wilderness characteristics may be less significant than in the case of a pristine viewshed.

- The Newberry Mountains Wilderness is farther away from the SEZ than the two areas discussed above, and portions of the area are partially screened from it. Although solar development would be visible in about 23% of the area within 15 mi (24 km) of the SEZ, none of the solar facilities would be visible within the most visually sensitive zone, the area within 5 mi (8 km) of the SEZ. Because of this distance and the existence of visual impacts associated with man-made disturbances between the WA and the SEZ, impacts on the wilderness characteristics of the WA from development in the SEZ are expected to be minor.

[1] The congressionally directed inventory and study of BLM's roadless areas received extensive public input and participation. By November 1980, the BLM had completed field inventories and designated about 25 million acres (101,000 km^2) of WSAs. Since 1980, Congress has reviewed some of these areas and has designated some as wilderness and released others for non-wilderness uses. Until Congress makes a final determination on a WSA, the BLM is required by FLPMA to manage these areas in a manner so as not to impair their suitability for preservation as wilderness.

Kelso Dunes and Bristol Mountains Wilderness

- The boundaries of these two WAs range from about 11 to 14 mi (18 to 23 km) from the eastern border of the SEZ. The Kelso Dunes Wilderness is completely screened within 5 mi (8 km) of the SEZ, and only a very small percentage of the area is visible out to 25 mi (40 km). No impact on wilderness characteristics in the Kelso Dunes wilderness is expected from development of the SEZ. The Bristol Mountains Wilderness is also completely screened from view of the SEZ within 5 mi (8 km), and although screened somewhat less than Kelso Dunes, again only a very small portion of the area is visible from the SEZ out to 25 mi (40 km). There is also expected to be no impact on wilderness characteristics within the Bristol Mountains Wilderness.

Ord-Rodman DWMA, Rodman Mountains Cultural Area, and Pisgah ACECs

- The Ord-Rodman DWMA and Pisgah ACECs abut portions of the Pisgah SEZ and are vulnerable to increased human traffic induced by the presence of the SEZ. While neither of these ACECs have a visual component in their reason for designation, they provide habitat for sensitive species. Any increase in human use and traffic in these areas represents some level of increased risk to the resources the areas were created to protect. The level of that risk and the susceptibility to resource damage cannot be assessed at this time, but it is possible that additional management efforts would be needed from the BLM to maintain the current level of protection. The Rodman Mountains Cultural Area also does not have a scenic resource component to its designation and is more remote from the SEZ than the other two ACECs; however, the resources it was established to protect are more susceptible to damage and loss. An increase in human use and traffic in the area would be assumed to increase the level of risk to these resources. As is the case for the other ACECs, it is likely the BLM would have to increase its management efforts to protect these resources if additional traffic is introduced to the area.

California Desert Conservation Area

- The viewshed within 25 mi (40 km) of the Pisgah SEZ includes about 552,000 acres (2,234 km^2), or about 2% of the CDCA (Table 9.3.3.2-1), and may be visible up to about 40 mi (64 km). Installation of renewable energy facilities is consistent with the CDCA Plan, and although full development of the SEZ would adversely affect wilderness characteristics in 29,717 acres (120 km^2) in one designated WA and one WSA and may have a small effect wilderness recreation and on primitive recreation use in the immediate area of the SEZ, impacts on the CDCA appear to be small.

Old Spanish National Historic Trail

- Two segments of the Old Spanish National Historic Trail are within 8 to 19 mi (13 to 31 km) of the SEZ and, depending on the solar technology employed, may have some view of the solar facilities in the SEZ. Because of the distance to the trail segments it is likely there would be no impact from development of the SEZ on potential management of the trail. See Section 9.3.17 for a more thorough discussion of the Old Spanish National Historic Trail.

9.3.3.2.2 Transmission Facilities and Other Off-Site Infrastructure

Because of the availability of an existing transmission line and access to I-40, no additional construction of transmission or road facilities was assessed. Should additional transmission lines be required outside of the SEZ, there may be additional impacts on specially designated areas. See Section 9.3.1.2 for the development assumptions underlying this analysis.

9.3.3.3 SEZ-Specific Design Features and Design Feature Effectiveness

Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would provide adequate mitigation for some identified impacts. The exception would be adverse impacts on wilderness characteristics in the Cady Mountains WSA and Rodman Mountains Wilderness that would not be fully mitigable and are related to the exclusion of many existing and potential uses of the public land, perhaps in perpetuity; the visual impact of an industrialized-looking solar facility within an otherwise rural area; and induced land use changes on state and private lands.

Proposed design features specific to the proposed SEZ include the following:

- Application of SEZ-specific design features for visual resource impacts (Section 9.3.14) may reduce the visual impact on wilderness characteristics.

- Once construction of solar energy facilities begins, the BLM would monitor whether there are increases in traffic to the Ord-Rodman DWMA, Rodman Mountains Cultural Area, and Pisgah ACECs and determine whether additional mitigation measures are required to continue to protect the resources in these areas.

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9.3.4 Rangeland Resources

Rangeland resources include livestock grazing and wild horses and burros, all of which are managed by the BLM. These resources and possible impacts on them from solar development within the proposed Pisgah SEZ are discussed in Sections 9.3.4.1 and 9.3.4.2.

9.3.4.1 Livestock Grazing

9.3.4.1.1 Affected Environment

Only the portion of the Pisgah SEZ north of I-40 is currently included within the Cady Mountain grazing allotment (BLM 2009d); the acreage within the SEZ is about 5% of the total allotment. The allotment is in non-use and has been identified by the allotment operator for voluntary relinquishment. Once the request for relinquishment has been processed by the BLM, the allotment will no longer be available for livestock grazing (Chavez 2010).

9.3.4.1.2 Impacts

Since the current allotment is being relinquished, there would be no effect on livestock grazing.

9.3.4.1.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features would be necessary to protect or minimize impacts on livestock grazing.

9.3.4.2 Wild Horses and Burros

9.3.4.2.1 Affected Environment

Section 4.4.2 discusses wild horses (*Equus caballus*) and burros (*E. asinus*) that occur within the six-state study area. Twenty-two BLM wild horse and burro HMAs occur within California. In addition, several HMAs in Arizona are located near the Arizona–California border. None of these HMAs occur within a 50-mi (80-km) radius of the proposed Pisgah SEZ (Figure 9.3.4.2-1). The closest HMAs to the SEZ are the Chicago Valley HMA, located more than 70 mi (112 km) north of the SEZ, and Palm Canyon HMA, located more than 65 mi (104 km) south of the SEZ.

In addition to the HMAs managed by the BLM, the USFS has 51 established wild horse and burro territories in Arizona, California, Nevada, New Mexico, and Utah; it is the lead

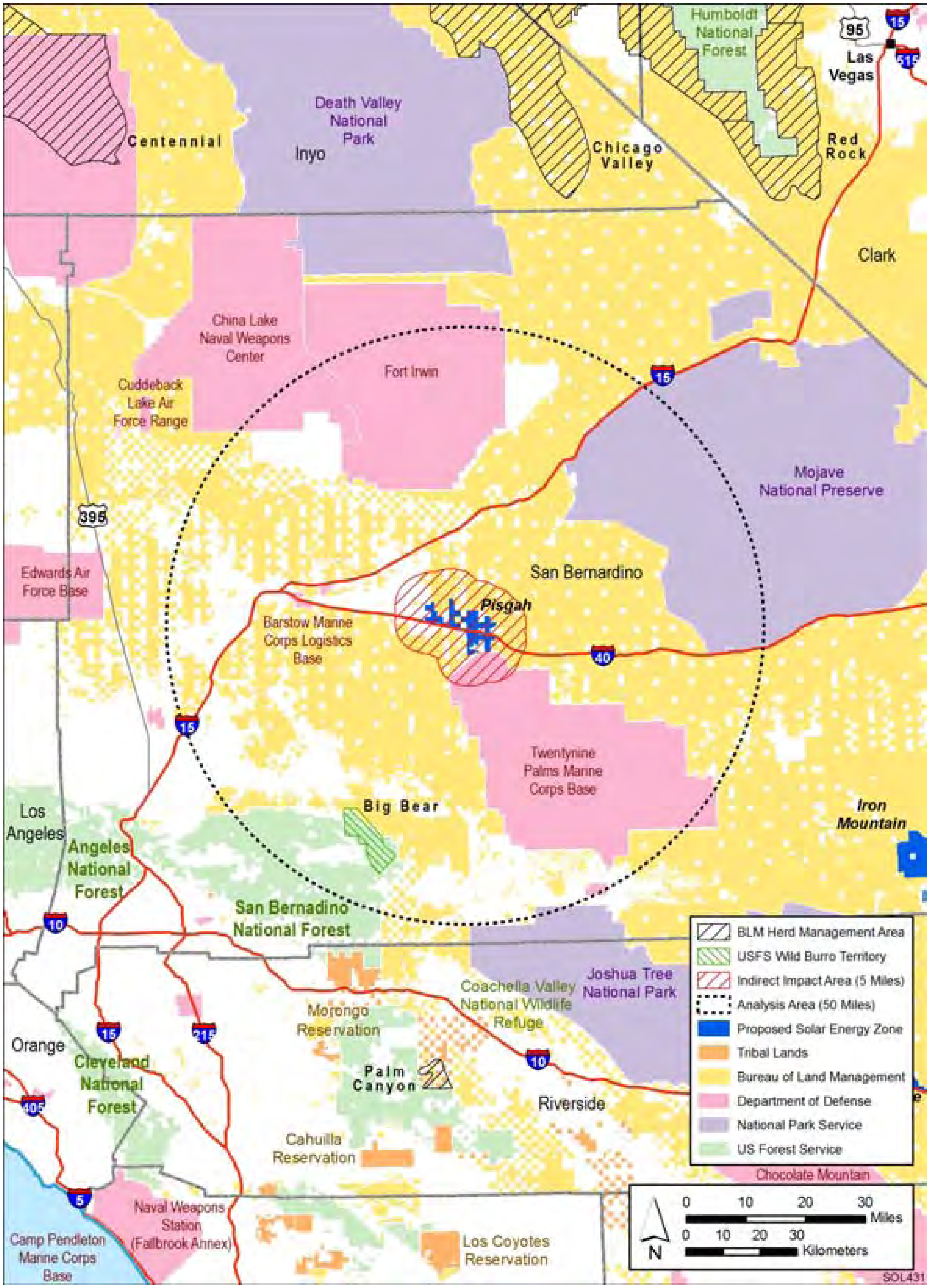

FIGURE 9.3.4.2-1 BLM Wild Horse and Burro HMAs and USFS Wild Horse and Burro Territories Located near the Proposed Pisgah SEZ Region (Sources: BLM 2009a,b; USFS 2007)

management agency that administers 37 of these territories (Giffen 2009; USFS 2007). The closest territory to the proposed Pisgah SEZ is the Big Bear Territory within the San Bernardino National Forest. It is located about 32 mi (51 km) south of the SEZ (Figure 9.3.4.2-1). This territory is managed for a population of 60 wild burros (USFS 2007).

9.3.4.2.2 Impacts

Because the proposed Pisgah SEZ is 65 mi (104 km) or more from any wild horse and burro HMA managed by the BLM and about 32 mi (51 km) from any wild horse and burro territory administered by the USFS, solar energy development within the SEZ would not affect wild horses and burros managed by these agencies.

9.3.4.2.3 SEZ-Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A, Section A.2.2, would reduce the potential for effects on wild horses and burros. No proposed Pisgah SEZ-specific design features would be necessary to protect or minimize impacts on wild horses and burros.

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9.3.5 Recreation

9.3.5.1 Affected Environment

The proposed Pisgah SEZ is very flat, largely dominated by creosote shrublands, and during the summer months does not provide an environment conducive to non-motorized recreation. Although there are several roads, including a county road, that provide easy access to most of the area, recreational use is likely limited. The CDCA, like many remote areas of the public lands, attracts individuals and families that are seeking undeveloped recreation opportunities. Opportunities to explore old town sites, mining operations, and old roads, as well as opportunities for hunting and backcountry camping, hiking, and wildlife and wildflower viewing are important attractions throughout the CDCA. There are areas both in and adjacent to the Pisgah SEZ that provide these kinds of attractions.

The area is included in the West Mojave Desert Off-Road Vehicle Designation Project (BLM 2003), which provides direction for designation of roads and trails as closed, limited, or open for vehicular use. There are several segments of roads in the SEZ that are designated for limited use (Blaine 2010). These OHV routes designated as open within the Pisgah SEZ are discussed in Section 9.3.21 and shown in Figure 9.3.21-1.

9.3.5.2 Impacts

9.3.5.2.1 Construction and Operations

Recreational users would lose the use of any portions of the SEZ developed for solar energy production. Because of the impact of a large and highly visible industrial type development in the SEZ, opportunities for an undeveloped and primitive recreation experience around the SEZ also would be lost or reduced. Access through areas developed for solar power production could be closed or rerouted, making it more difficult or impossible to access current destinations although existing county roads would continue to provide general access. While there are no recreational use statistics for the area of the SEZ and surrounding lands, it is anticipated that the loss of recreational use caused by development of the Pisgah SEZ would be small.

Open OHV routes crossing areas granted ROWs for solar facilities would be re-designated as closed. However, a programmatic design feature addressing recreational impacts would require consideration of the development of alternative routes that would retain a similar level of access across and to public lands as a part of the project proposal (see Section 5.5.1 for more details on how routes coinciding with proposed solar facilities would be treated).

On the basis of the viewshed analysis (see Table 9.3.3.2-1), the Pisgah SEZ would be highly visible from the Rodman Mountain WA and the Cady Mountain WSA. The presence of solar development in the SEZ would be likely to adversely affect recreational use of these areas, since large portions of the areas are within the most sensitive visual zone surrounding the proposed SEZ.

9.3.5.2.2 Transmission Facilities and Other Off-Site Infrastructure

Because of the availability of an existing transmission line and access to I-40, no additional construction of transmission or road facilities was assessed. Should additional transmission lines be required outside of the SEZ, there may be additional impacts on specially designated areas. See Section 9.3.1.2 for the development assumptions underlying this analysis.

9.3.5.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features were identified for addressing impacts on recreation use at the proposed Pisgah SEZ. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program would provide some mitigation for some identified impacts. The exceptions would be the loss of recreation use within the SEZ and loss of opportunities for undeveloped and primitive recreation around the SEZ; wilderness recreation use in the Cady Mountains WSA and the Rodman Mountains WA would also be adversely affected.

9.3.6 Military and Civilian Aviation

9.3.6.1 Affected Environment

The proposed Pisgah SEZ is completely blanketed under eight MTRs that include a mixture of visual and instrument routes, with the lowest floor elevation at 200 ft (61 m) AGL. The BLM has identified this as an area where advance consultation with the DoD is required prior to approval of activities that could adversely affect the use of the MTRs.

The Barstow-Dagett public airport is located about 12 mi (19 km) west of the SEZ.

9.3.6.2 Impacts

The development of any solar energy or transmission facilities that encroach into the airspace of an MTR could interfere with military training activities and could create a safety concern. While the military has indicated that solar development on portions of the Pisgah SEZ is compatible with its existing uses, it has also commented that other portions should have height limits for facilities, and some areas may be incompatible with existing military use.

The system of military airspace in the Southwest overlaps much of the area of highest interest for solar development and there is potential for solar development to result in cumulative effects on the system of MTRs that stretch beyond just one SEZ or solar project.

No impacts are expected on the Barstow-Daggett Airport.

9.3.6.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features were identified for addressing impacts on military and civilian aviation at the proposed Pisgah SEZ. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program would provide adequate mitigation for identified impacts.

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9.3.7 Geologic Setting and Soil Resources

9.3.7.1 Affected Environment

9.3.7.1.1 Geologic Setting

Regional Geology

The proposed Pisgah SEZ lies within the western Mojave Desert region of the Basin and Range physiographic province in southern California. The site is in a northwest-trending alluvial valley southeast of the Mojave River Valley, between the Cady Mountains to the northeast and the Newberry, Rodman, and Lava Bed Mountains to the southwest (Figure 9.3.7.1-1).

Exposed sediments in the Pisgah region consist mainly of modern alluvial fan and playa lake deposits (Figure 9.3.7.1-2). The Pisgah lava field is a prominent feature, covering an area of about 19,770 acres (80 km^2) southeast of the Pisgah SEZ. The lava field is made of a series of Quaternary basalt flows (predominantly pahoehoe) erupted from the Pisgah Crater over alluvial fan and lacustrine sediments. Drainage in the valley is internal, flowing to either Troy Dry Lake (to the northwest of the SEZ) or Lavic Lake (to the southeast). The two dry lakes may have been connected during the Pleistocene before damming by the Pisgah basalt flows and later development of the playas. Lake sediments are at least 160 ft (50 m) thick above the lava flows, especially in the northeast part of Lavic Lake. Portions of the Pisgah SEZ are covered by Troy Dry Lake sediments and Pisgah basalt lava flows. The surrounding mountains are composed of various sedimentary and volcanic rocks of Tertiary and pre-Tertiary age (Bassett and Kupfer 1964; Gawarecki 1968; Wood and Keinle 1993).

Topography

The proposed Pisgah SEZ is located in an alluvial valley between the Cady Mountains (to the northeast) and the Rodman and Lava Bed Mountains (to the southwest), about 7 mi (11 km) southeast of the Mojave River. Elevations range from about 2,355 ft (718 m) at the northeastern corner of the SEZ to less than 1,805 ft (550 m) in the center of the site (Figure 9.3.7.1-3).

Geologic Hazards

The types of geologic hazards that could potentially affect solar project sites and their mitigation are discussed in Sections 5.7.3 and 5.7.4. The following sections provide a preliminary assessment of these hazards at the proposed Pisgah SEZ. Solar project developers may need to conduct a geotechnical investigation to assess geologic hazards locally to better identify facility design criteria and site-specific design features to minimize their risk.

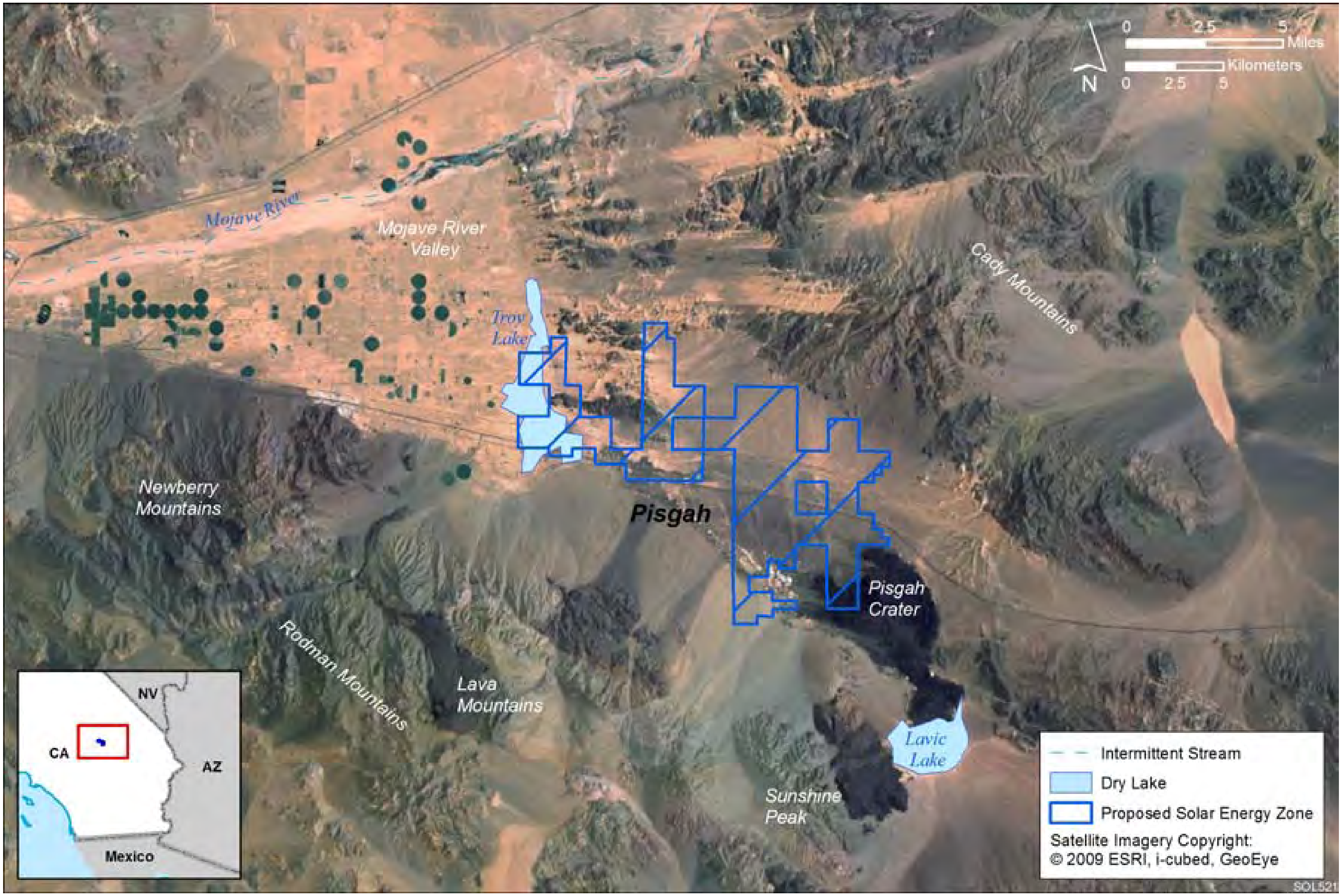

FIGURE 9.3.7.1-1 Physiographic Features in the Mojave River Valley Region

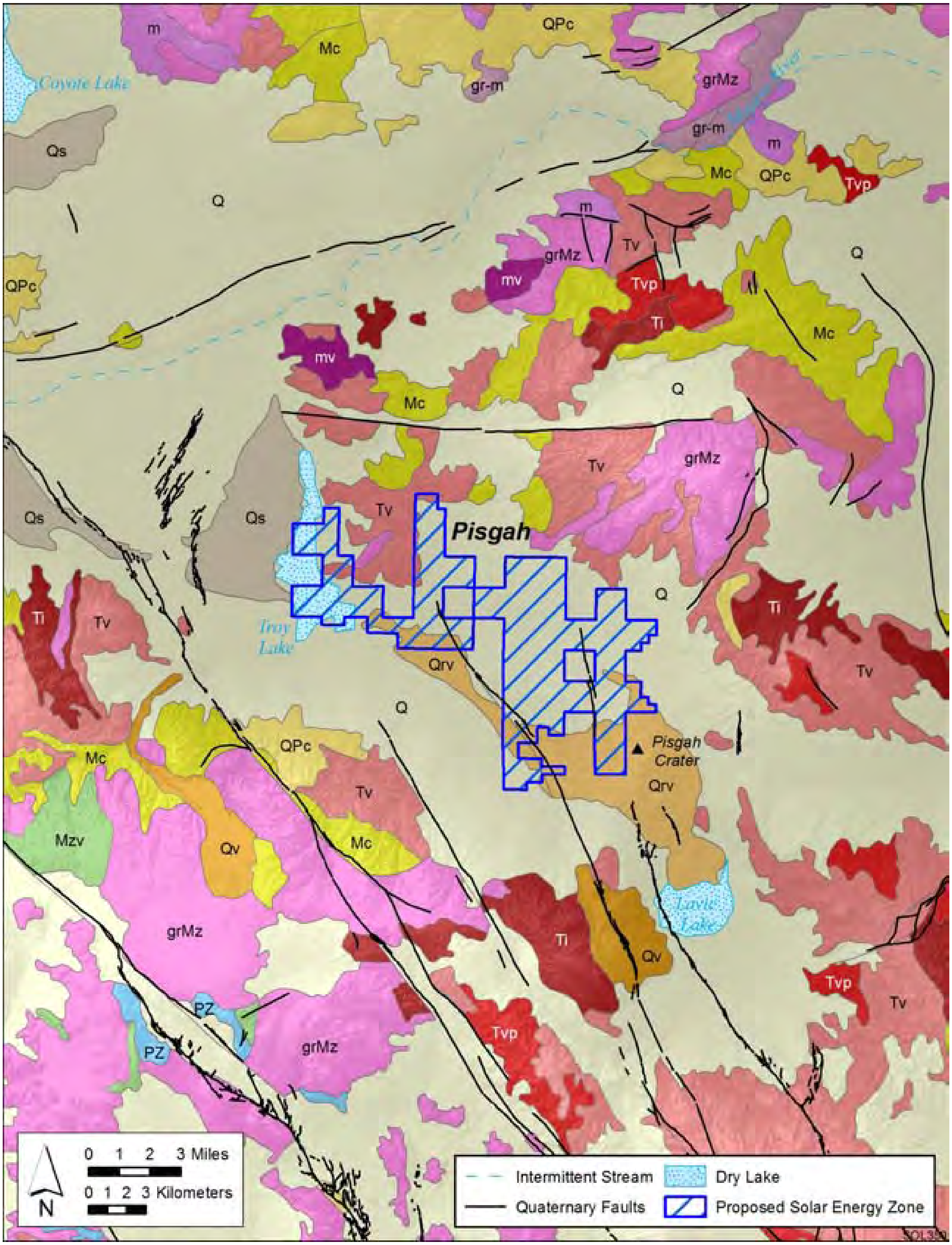

FIGURE 9.3.7.1-2 Geologic Map of the Mojave River Valley Region (adapted from Lundington et al. 2007 and Gutierrez et al. 2010)

FIGURE 9.3.7.1-2 (Cont.)

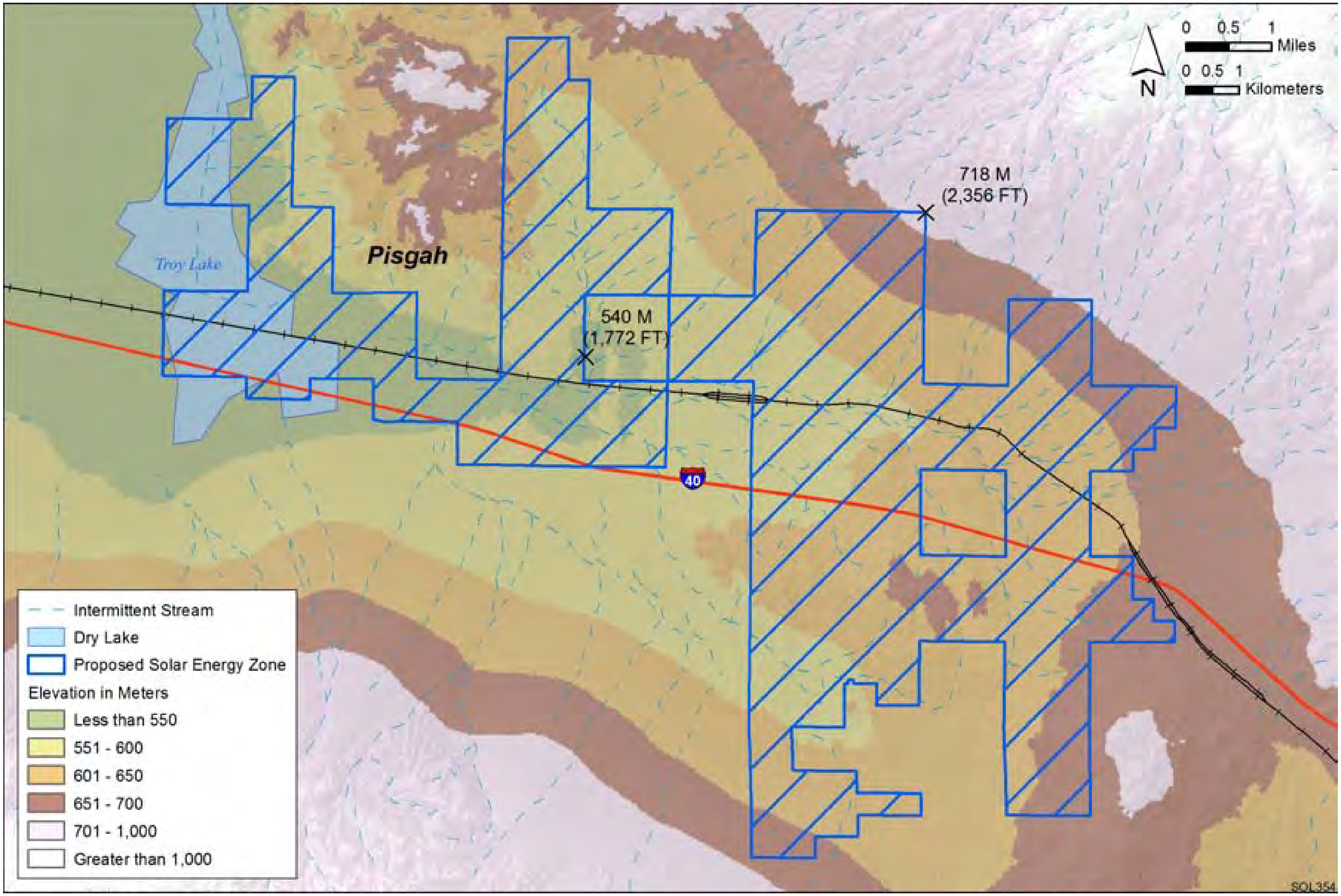

FIGURE 9.3.7.1-3 General Terrain of the Proposed Pisgah SEZ

Seismicity. The proposed Pisgah SEZ is located on the Mojave structural block at the eastern margin of the Eastern California Shear Zone, a seismically active region dominated by northwest-trending right-lateral strike-slip faulting and categorized as “potentially active” (i.e., having surface displacement within the last 11,000 years [Holocene]) under the Alquist-Priolo Earthquake Fault Zoning Act (Figure 9.3.7.1-4). The term “potentially active” generally denotes that a fault has shown evidence of surface displacement during Quaternary time (the last 1.6 million years). However, because there are numerous such faults in California, the State Geologist has introduced new, more discriminating criteria for zoning faults under the Alquist-Priolo Act. Currently, zoned faults include those that are “sufficiently active,” showing evidence of surface displacement within the past 11,000 years along one or more of its segments or branches, and “well-defined,” having a clearly detectable trace at or just below the ground surface (Bryant and Hart 2007).

The proposed Pisgah SEZ is intersected by the Pisgah section of the Pisgah-Bullion Fault Zone and the Lavic Lake Fault Zone (Figure 9.3.7.1-5). The Calico section of the Calico-Hidalgo Fault Zone and the Rodman Fault lie about 8 mi (13 km) and 5 mi (8 km) to the southwest, respectively. These faults are major strands of a complex fault system of right-lateral strike-slip faults within the Mojave structural block. Offsets of volcanic rocks of Pleistocene age (basalt flows from the Pisgah and Sunshine Craters) and younger alluvial fan deposits along the Pisgah section place the most recent activity at less than 15,000 years ago and the most recent event within the past 3,000 years. Slip rates along the Pisgah section have been estimated at 0.6 mm/yr (Dokka 1983; Treiman 2003a; Bryant and Hart 2007).

The Lavic Lake Fault is a northwest-striking fault on the same trend (and possibly related to) the Pisgah-Bullion Fault Zone. It was the causative fault in the 1999 Hector Mine earthquake (with a magnitude of 7.1), which resulted in an average right-lateral displacement of about 8.2 ft (2.5 m) and a maximum displacement of about 18 ft (5.5 m). Estimated slip rates for the fault range from about 0.2 to 1 mm/yr (Treiman 2003b).

Since 1973, more than 3,400 earthquakes have been recorded within a 61-mi (100-km) radius of the Pisgah SEZ. Five of these earthquakes registered moment magnitudes[2] greater than 6.0: July 8, 1986 (Mw 6.5); April 23, 1992 (Mw 6.1); June 28, 1992 (Landers, Mw 6.5 and Mw 7.3); and October 16, 1999 (Hector Mine, Mw 7.1) (USGS 2010c). The 1992 Landers earthquake ruptured five separate faults within the Pisgah-Bullion Fault Zone (SCEDC 2010a) and was centered about 35 mi (60 km) south of the Pisgah SEZ; the 1999 Hector Mine earthquake ruptured the Lavic Lake and Bullion faults (SCEDC 2010b) and was centered about 12 mi (20 km) to the south–southeast.

Liquefaction. The proposed Pisgah SEZ lies within an area where the peak horizontal acceleration with a 10% probability of exceedance in 50 years is between 0.30 and 0.50 g.

[2] Moment magnitude (Mw) is used for earthquakes with magnitudes greater than 3.5 and is based on the moment of the earthquake, equal to the rigidity of the earth times the average amount of slip on the fault times the amount of fault area that slipped (USGS 2010d).

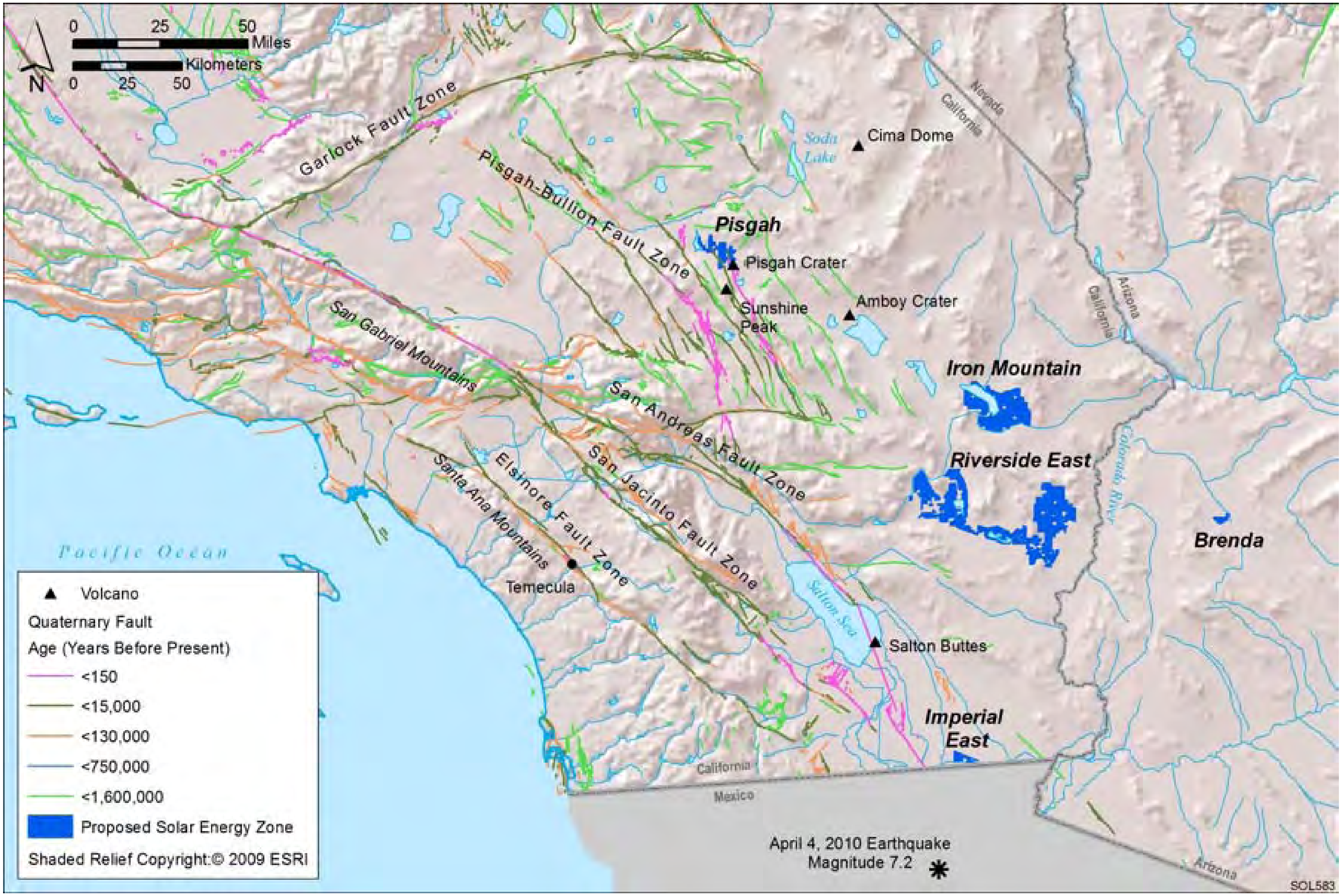

FIGURE 9.3.7.1-4 Quaternary Faults and Volcanoes in Southern California (Sources: USGS and CGS 2010; USGS 2010c)

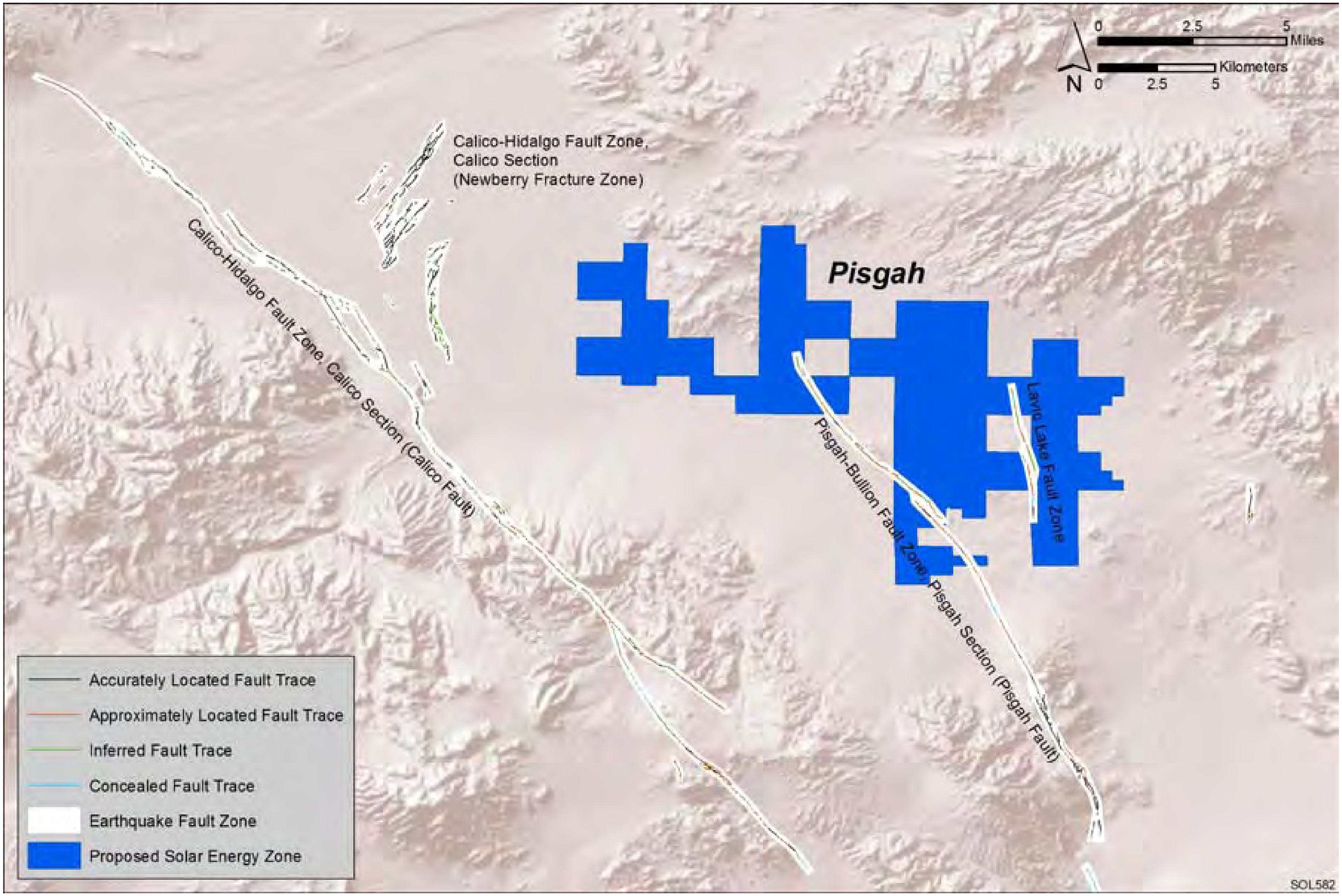

FIGURE 9.3.7.1-5 Delineated Earthquake Fault Zones near the Proposed Pisgah SEZ (CGS 2010)

Shaking associated with this level of acceleration is generally perceived as very strong to severe; the potential damage to structures is moderate to heavy (USGS 2008).

A regional evaluation for liquefaction hazards was completed for the San Bernardino Valley and vicinity in western San Bernardino County by Matti and Carson (1991); the study did not include the eastern part of San Bernardino County where the Pisgah SEZ is located. San Bernardino Valley is located between the San Andreas and San Jacinto Fault Zones, where the peak horizontal acceleration with a 10% probability of exceedance in 50 years is much higher (between 0.88 and 1.62 g) than that for the Pisgah region; therefore, only general conclusions from the study are presented here.

The evaluation considered three aspects of liquefaction: susceptibility, opportunity, and potential. Susceptibility identifies sedimentary materials likely to liquefy during a seismic event on the basis of their physical properties, depth to groundwater, expected earthquake magnitude, and strength of ground shaking. Opportunity considers the recurrence intervals for earthquake shaking strong enough to cause liquefaction in susceptible materials. The potential for ground failure due to liquefaction evaluation then combines the results of the susceptibility and opportunity evaluations and identifies the areas most and least likely to experience liquefaction (Matti and Carson 1991).

Investigators found that the level of liquefaction susceptibility was most dependent on two factors: (1) depth to the groundwater table and (2) the intensity and duration of ground shaking as determined by an earthquake's magnitude and the distance from the causative fault. These factors in combination with penetration-resistance data from various locations within the San Bernardino Valley allowed them to conclude that liquefaction susceptibility gradually decreases with increasing depth to groundwater, increasing distance away from the causative fault, and increasing geologic age (and induration) of sedimentary materials. Studies of the effects of ground shaking after the 1999 Hector Mine earthquake (centered near the Pisgah SEZ) found little damage to bridges and highways, especially along I-40. Since there were no strong-motion stations near the epicenter at the time, horizontal acceleration was estimated based on the displacement of rocks near the fault zone. These estimates indicated a slightly lower-than-expected shaking during the earthquake (Rymer et al. 2002). For the Pisgah SEZ, the opportunity for liquefaction is considered high, because it sits within a seismically active area and intersects the causative fault for the 1999 Hector Mine earthquake. However, the lack of evidence for liquefaction in the area as a result of the 1999 earthquake and the depth of groundwater below the site (greater than 60 ft [18 m]; Section 9.3.9.1.2) suggest that the sediments in the area may have a low liquefaction susceptibility. These factors combined would indicate preliminarily that the liquefaction potential for the Pisgah SEZ is low.

Volcanic Hazards. The nearest volcano is the Pisgah Crater, located within the Pisgah lava field (part of the Lavic Lake volcanic field) immediately adjacent to the southeast corner of the proposed Pisgah SEZ (Figure 9.3.7.1-4). The 328-ft (100-m) high cinder cone is the youngest vent in the basalt field. Lava flows issuing from vents within the basalt field sit above alluvial fan and playa lake deposits. A similar, lesser known cinder cone and lava field also is present in the Sunshine Peak area, about 6 mi (10 km) to the south. Researchers date the most recent activity associated with the Pisgah volcano to about 25,000 years ago (Smithsonian 2010; Bassett and Kupfer 1964). Hazards resulting from these kinds of eruptions would likely be less severe than those from more silicic sources (although given the volcano's close proximity to the Pisgah SEZ, could be more severe); they include the formation of cinder cones, small volumes of tephra, and lava flows (Miller 1989).

The Amboy Crater and lava field (also part of the Lavic Lake volcanic field) are about 40 mi (64 km) southeast of the Pisgah SEZ and immediately northwest of Bristol Dry Lake (Figure 9.3.7.1-4). Amboy Crater is a 250-ft (76-m) high complex basaltic cinder cone surrounded by about 24 mi^2 (62 km^2) of mafic lava flows. The basalt fields erupted from several vents about 10,000 years ago (Parker 1963; Bassett and Kupfer 1964). Because of the basaltic composition of the Amboy Crater lava, hazards likely would be similar to those described for the Pisgah Crater but would depend on factors such as location, size, and timing (season).

The Cima dome and volcanic field east of Soda Lake is about 32 mi (51 km) to the northeast of the Pisgah SEZ (Figure 9.3.7.1-4). The volcanic field consists of about 40 basaltic cones and more than 60 associated mafic lava flows covering an area of about 58 mi^2 (150 km^2). It has had three periods of activity from the late Miocene through the late Pleistocene, the most recent having occurred about 15,000 years ago (Dohrenwend et al. 1984). Because of its basaltic nature, hazards associated with the Cima volcanic field would like be similar to those described for the Lavic Lake volcanic field, but would depend on factors such as location, size, and timing (season).

The nearest active volcano is Mount St. Helens in the Cascade Range (Washington), about 840 mi (1,350 km) to the north-northwest of the Pisgah SEZ, which has shown some activity as recently as 2008. The nearest volcano that meets the criterion for an unrest episode is the Long Valley Caldera in east-central California, about 240 mi (380 km) to the northwest, which has experienced recurrent earthquake swarms, changes in thermal springs and gas emissions, and uplift since 1980 (Diefenbach et al. 2009). The Long Valley Caldera is part of the Mono-Inyo Craters volcanic chain that extends from Mammoth Mountain (on the caldera rim) northward about 25 mi (40 km) to Mono Lake. Small to moderate eruptions have occurred at various sites along the volcanic chain in the past 5,000 years at intervals ranging from 250 to 700 years. Windblown ash from some of these eruptions is known to have drifted as far east as Nebraska. While the probability of an eruption within the volcanic chain in any given year is small (less than 1%), serious hazards could result from a future eruption. Depending on the location, size, timing (season), and type of eruption, hazards could include mudflows and flooding, pyroclastic flows, small to moderate volumes of tephra, and falling ash (Hill et al. 1998, 2000; Miller 1989).

Earthquake swarms also occurred at Medicine Lake Volcano in northern California (Cascade Range) for a few months in 1988. Medicine Lake is about 550 mi (885 km) northwest of the Pisgah SEZ (Diefenbach et al. 2009). The most recent eruption at Medicine Lake was rhyolitic in composition and occurred about 900 years ago (USGS 2010e). Nearby Lassen Peak last erupted between 1914 and 1917; at least two blasts during this period produced mudflows that inundated the valley floors of Hut and Lost Creeks to the east. Tephra from the most violent eruption, occurring on May 22, 1915, was carried by prevailing winds and deposited as far as 310 mi (500 km) to the east (Miller 1989).

Slope Stability and Land Subsidence. The incidence of rock falls and slope failures can be moderate to high along mountain fronts and can present a hazard to developments on the relatively flat terrain of valley floors, such as the valley in which the Pisgah SEZ is located if they are located at the base of steep slopes. The risk of rock falls and slope failures decreases toward the flat valley center.

Numerous lava tube features have been documented in the Pisgah lava field by Harter (1992). These include more than 300 small surface tube caves and semitrenches. Lava tubes are sites of potential collapse if they are subjected to increased loads during construction. The collapse hazard is only of potential concern for the parts of the SEZ that are covered by lava, an area of about 3,479 acres (14 km^2) or about 15% of the proposed Pisgah SEZ.

There has been no land subsidence monitoring within the valley to date; however, 32- to 64-ft (10- to 20-m) long earth fissures and 3-ft (1-m) wide sinkholes associated with subsidence have been documented in the Temecula area of southwestern Riverside County, about 100 mi (160 km) south-southwest of the proposed Pisgah SEZ (Figure 9.3.7.1-4). The subsidence is the result of groundwater overdrafts in the Temecula-Wolf Valley that have caused differential compaction in the sediments of the underlying aquifer. Land failure caused by sinkholes and fissures have been significant enough to damage buildings, roads, potable water and sewer lines, and other infrastructure (Corwin et al. 1991; Shlemon 1995). Land subsidence has also been documented as far back as the 1970s in southern California's San Joaquin Valley, where the maximum subsidence due to extensive groundwater withdrawals for irrigation is greater than 28 ft (9 m) (Galloway et al. 1999), and in the Wilmington Oil Field as a result of oil extraction from the Los Angeles basin in southern Los Angeles County (Kovach 1974).

Other Hazards. Other potential hazards at the Pisgah SEZ include those associated with soil compaction (restricted infiltration and increased runoff), expanding clay soils (destabilization of structures), and hydro-compactable or collapsible soil (settlement). Disturbance of soil crusts and desert varnish on soil surfaces may also increase the likelihood of soil erosion by wind.

Alluvial fan surfaces, such as those in the Pisgah SEZ valley, can be the sites of damaging high-velocity flash floods and debris flows during periods of intense and prolonged rainfall. The nature of the flooding and sedimentation processes (e.g., streamflow versus debris flow) will depend on specific morphology of the fan (National Research Council 1996).

9.3.7.1.2 Soil Resources

Because soil mapping is not complete for the Mojave Desert area, the map unit composition within the proposed Pisgah SEZ has not been delineated. Therefore, only soil series are mapped in Figure 9.3.7.1-6 and described in Table 9.3.7.1-1. Soils within the SEZ are

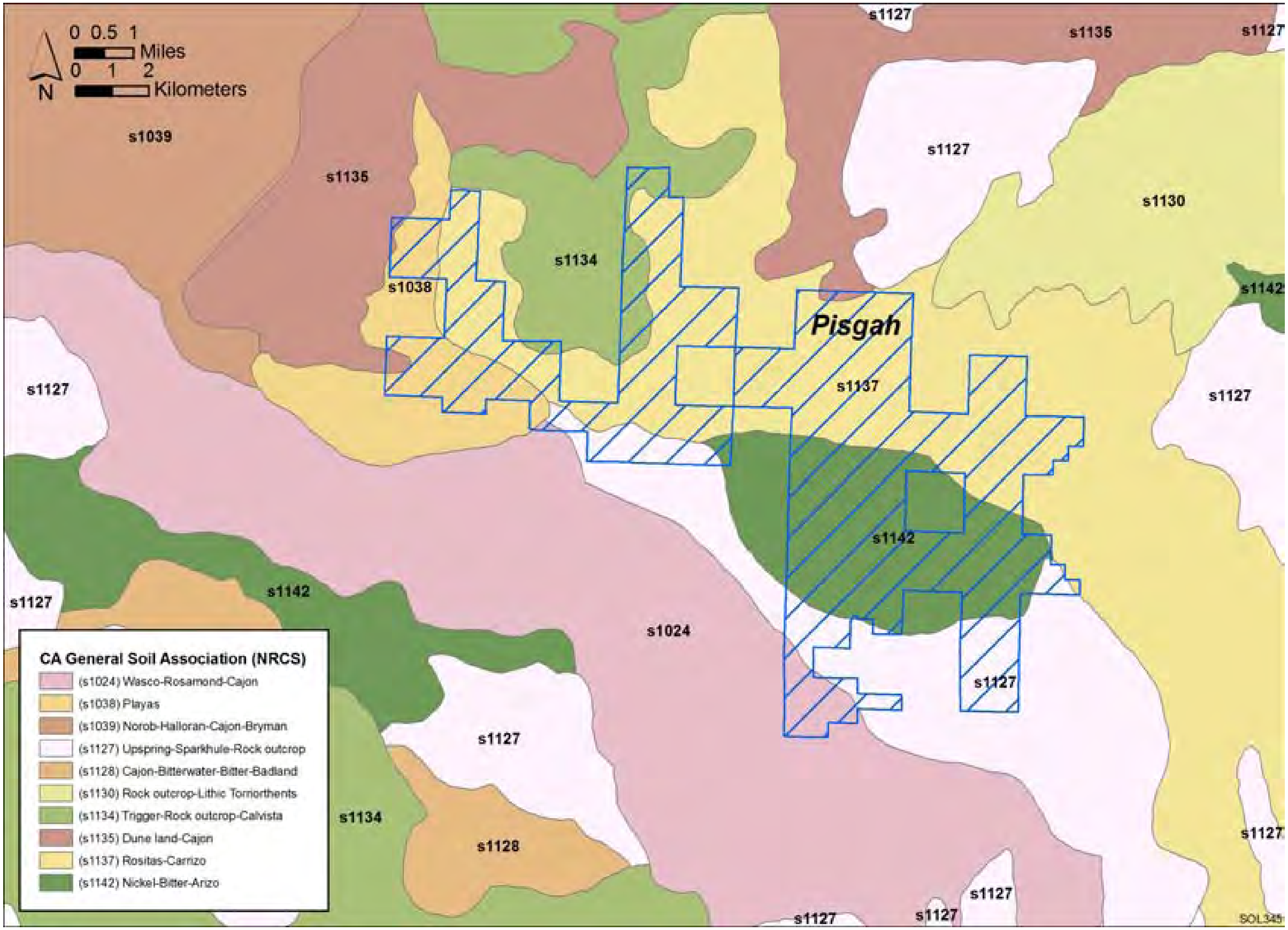

FIGURE 9.3.7.1-6 Soil Map for the Proposed Pisgah SEZ (NRCS 2008)

TABLE 9.3.7.1-1 Summary of Soil Series within the Proposed Pisgah SEZ

Map Unit Symbol	Map Unit Name	Water Erosion Potential[a]	Wind Erosion Potential	Description	Area in Acres[a] (% of SEZ)
s1137	Rositas-Carrizo	–[b]	–[b]	*Rositas series* are gently sloping soils on dunes and sand sheets (gradients of 0 to 30%). Very deep and somewhat excessively drained with low surface runoff potential (high infiltration rate) and rapid permeability. Typically fine sand. *Carrizo series* are gently sloping soils on floodplains, alluvial fans, fan piedmonts, and bolson floors (gradients of 0 to 15%). Parent material consists of alluvium from mixed sources. Very deep and excessively drained with negligible to very low surface runoff potential and rapid to very rapid permeability. Typically extremely gravelly sand. Aridic soil moisture regime. Used mainly as rangeland and wildlife habitat.	11,390 (48)
s1142	Nickel-Bitter-Arizo	–	–	*Nickel series* are gently sloping soils on alluvial fan remnants. Parent material consists of alluvium from mixed sources. Very deep and well-drained with low to medium surface runoff potential and moderate permeability. Typically a gravelly, very fine sandy loam. *Bitter series* are gently sloping soils on dissected fan terraces. Parent material weathered from all types of rocks. Deep and well-drained with medium surface runoff potential and moderately slow permeability. Typically an extremely gravelly sandy loam. *Arizo series* are gently sloping soils on recent alluvial fans, fan aprons, fan skirts, stream terraces, and floodplains. Parent material consists of alluvium from mixed sources. Very deep and excessively drained with negligible to medium surface runoff potential and rapid to very rapid permeability. Typically a very gravelly fine sand. All series used as rangeland and desert wildlife habitat.	5,972 (25)

TABLE 9.3.7.1-1 (Cont.)

Map Unit Symbol	Map Unit Name	Water Erosion Potential[a]	Wind Erosion Potential	Description	Area in Acres[a] (% of SEZ)
s1127	Upspring-Sparkhule-Rock outcrop	–	–	*Upspring series* are gently to greatly sloping soils on hills, mountains, and plateaus. Parent material derived from basic igneous rocks and pyroclastics. Very shallow and shallow and somewhat excessively drained with high to very high surface runoff potential and moderately rapid permeability over impermeable bedrock. Typically a very stony loam. Used for watershed, wildlife habitat, and recreation. *Sparkhule series* are gently sloping to sloping soils on rock pediments and hills. Parent material consists of residuum from igneous rocks. Shallow to rock and well-drained soils with high to very high surface runoff potential and moderately slow permeability. Typically a gravelly sandy loam. Used for wildlife habitat, military operations, and recreation.	2,752 (11)
s1038	Playas	–	–	Very poorly drained soils formed in flats and closed basins; moderately to strongly saline. Medium surface runoff potential and low permeability.	1,919 (8)
s1134	Trigger-Rock outcrop-Calvista	–	–	*Trigger series* are gently sloping to sloping soils on uplands. Parent material weathered from hard sedimentary rocks. Shallow and well-drained with medium to rapid surface runoff and moderately rapid permeability. Typically a gravelly sandy loam. Used for wildlife habitat, limited grazing, and recreation. *Calvista series* are gently sloping soils on mountain ridges. Parent material consists of residuum from granite. Shallow and well-drained with medium to rapid surface runoff and moderately rapid permeability. Typically a sandy loam. Used for desert range; small areas for home sites.	916 (4)

TABLE 9.3.7.1-1 (Cont.)

Map Unit Symbol	Map Unit Name	Water Erosion Potential[a]	Wind Erosion Potential	Description	Area in Acres[a] (% of SEZ)
s1024	Wasco-Rosamond-Cajon	–	–	*Wasco series* are nearly level soils on recent alluvial fans and floodplains. Parent material consists of alluvium from mixed sources. Very deep and well-drained with negligible or very low surface runoff potential and moderately rapid permeability. Typically a sandy loam. Used for growing field, forage, and row crops. *Rosamond series* soils are nearly level soils on the lower margin of alluvial fans between sloping fans and playas. Parent material derived from granitic alluvium. Deep and well-drained with medium surface runoff potential and moderate to moderately slow permeability. Typically a fine sandy loam. Used for desert range. *Cajon series* described above.	804 (3)
s1135	Dune land-Cajon	–	–	*Dune land* soils are constantly shifting, medium-grained sand deposited by wind blowing across the valley. *Cajon series* soils are gently sloping soils on alluvial fans, fan aprons, fan skirts, and river terraces. Parent material consists of sandy alluvium from granitic rocks. Very deep and somewhat excessively drained with negligible to low surface runoff potential and rapid permeability. Typically sand; used for rangeland, watershed, and recreation.	197 (<1)

[a] To convert acres to km^2, multiply by 0.004047.

[b] A dash indicates water and wind erosion potential not rated at the Soil Series taxonomic level.

Source: NRCS (2006).

predominantly gravelly alluvial sands and fine-grained eolian sands, which together make up about 73% of the site's soil coverage. These soils are characterized as deep and well drained, with low to medium surface runoff potential and moderate to very rapid permeability. The poorly drained soils of Troy Dry Lake (on the west end of the SEZ) make up about 8% of the site's soil coverage. The composition of these soils has not been reported but likely consists of brine-saturated clay and evaporite deposits. The Pisgah lava field covers about 15% of the SEZ. The fine-grained sands are highly susceptible to wind erosion; these sands and the clays within dry lakebeds could generate fugitive dust if disturbed. Biological soil crusts and desert pavement have not been documented in the SEZ but may be present.

9.3.7.2 Impacts

Impacts on soil resources would occur mainly as a result of ground-disturbing activities (e.g., grading, excavating, and drilling), especially during the construction phase of a solar project. These include soil compaction, soil horizon mixing, soil erosion and deposition by wind, soil erosion by water and surface runoff, sedimentation, and soil contamination. Such impacts are common to all utility-scale solar energy developments in varying degrees and are described in more detail for the four phases of development in Section 5.7 .1.

Because impacts on soil resources result from ground-disturbing activities in the project area, soil impacts would be roughly proportional to the size of a given solar facility, with larger areas of disturbed soil having a greater potential for impacts than smaller areas (Section 5.7.2). The magnitude of impacts would also depend on the types of components built for a given facility since some components would involve greater disturbance and would take place over a longer timeframe.

The Pisgah lava field, which covers about 3,479 acres (14 km^2) along the southern portions of the SEZ, may not be a suitable location for construction because of its irregular, hard surface and abundant lava tubes, which occur as open trenches or caves with openings on the ground surface (as described by Harter 1992).

9.3.7.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features were identified for soil resources at the proposed Pisgah SEZ. Implementing the programmatic design features described in Appendix A, Section A.2.2, and the mitigation measures listed in Section 5.7.4 would reduce the potential for soil impacts during all project phases.

The feasibility of constructing solar facilities in the lava field area of the SEZ will need to be addressed by facility developers.

9.3.8 Minerals (Fluids, Solids, and Geothermal Resources)

9.3.8.1 Affected Environment

Public land in the Pisgah SEZ was closed in June 2009 to locatable mineral entry pending the outcome of this solar energy PEIS. Currently, there are 103 mining claims (lode, placer, and millsite) within the SEZ, most of which are located in the southern portion of the SEZ south of I-40, where there has been a mining operation for many years (BLM and USFS 2010a). Most of the land south of I-40 in the SEZ contains mining claims. There are no oil and gas leases within the proposed SEZ, nor are there any geothermal leases (BLM and USFS 2010b). The area is still open for discretionary mineral leasing, including leasing for oil and gas and for other leasable and saleable minerals.

9.3.8.2 Impacts

If the BLM identifies the area as an SEZ to be used for utility-scale solar development, it would continue to be closed to all incompatible forms of mineral development with the exception of the areas with existing mining claims. These mining claims represent prior existing rights that, if valid, would preclude solar energy development as long as they are in place. Development of solar resources on areas with mining claims could only occur if (1) the claims are abandoned, (2) the claims are demonstrated to not be valid and are vacated by the BLM, or (3) the claims are purchased by a solar developer. The latter two of these approaches could require considerable time, negotiation, and money to accomplish and are unlikely to occur. The mining claims represent a serious impediment to moving forward with planning solar development in the areas of the SEZ in which they are located, and are likely to prevent that development in the immediate future.

Elsewhere in the SEZ, where there are no mining claims, it is assumed that if solar development were to proceed, there would be no loss of locatable mineral production in the future. Since there are no oil and gas or geothermal leases in the area, it also is assumed that there would be no significant impacts on these resources if the area was developed for solar energy production.

If the area is identified as a solar energy development zone, some other mineral uses might be allowed on all or portions of the SEZ. For example, oil and gas development that involves the use of directional drilling to access resources under the area (should any be found) might be allowed. Also, the production of common minerals, such as sand, gravel, and mineral materials used for road construction, might take place in areas not directly developed for solar energy production.

9.3.8.3 SEZ-Specific Design Features and Design Feature Effectiveness

Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program would provide adequate mitigation for some identified impacts. The exception may be related to the extensive number of mining claims present in the SEZ south of I-40.

A proposed design feature specific to the proposed SEZ is the following:

- Consideration should be given to altering the boundaries of the SEZ to remove the areas with mining claims.

9.3.9 Water Resources

9.3.9.1 Affected Environment

The proposed Pisgah SEZ is located within the Southern Mojave-Salton Sea subbasin of the California hydrologic region (USGS 2010b) and the Basin and Range physiographic province characterized by intermittent mountain ranges and desert valleys (Planert and Williams 1995). The proposed SEZ has surface elevations ranging between 1,800 and 2,300 ft (549 and 701 m), with a general drainage pattern from east to west along the SEZ toward the southern portion of Troy Lake (Figure 9.3.9.1-1). This region is located within the Mojave Desert, which is characterized by extreme daily temperature ranges with low precipitation and humidity (CDWR 2009). The majority of the precipitation falls during the winter rainy season from November to March, with an annual average rainfall ranging between 4 and 6 in./yr (10 and 15 cm/yr) (MWA 2004; Mathany and Belitz 2008). Evapotranspiration estimates in this region vary between 12 and 24 in./yr (30.5 and 61.0 cm/yr) in the riparian regions of the Mojave River (Lines 1996) and pan evaporation rates are on the order of 74 in./yr (188 cm/yr) (Cowherd et al. 1988; WRCC 2010a).

9.3.9.1.1 Surface Waters (Including Drainages, Floodplains, and Wetlands)

The primary surface water features within the proposed Pisgah SEZ are several ephemeral washes coming off the Cady Mountains and the Lava Bed Mountains that drain east to west toward the Troy Lake area (Figure 9.3.9.1-1). Troy Lake is a dry lake consisting of playa and dune sediments that covers approximately 3,500 acres (14 km^2); approximately 1,550 acres (6 km^2) of this dry lake is within the boundaries of the western portions of the proposed SEZ. Additionally, the Lavic Lake dry lakebed is located 5 mi (8 km) to the southeast.

The Mojave River is an intermittent river that originates from the San Bernardino Mountains and flows north and northeast into the Mojave Desert. Historically, the Mojave River had several reaches with perennial flow, but currently the only reach of the Mojave River with perennial flow is located near the town of Victorville, approximately 50 mi (80 km) southwest of the proposed SEZ. The reach of the Mojave River that is closest to the proposed SEZ is located 7 mi (11 km) to the north and is typically dry at the surface except during large rainfall events (Lines 1996).

Flood hazards have not been identified (Zone D) for the region surrounding the proposed Pisgah SEZ (FEMA 2009). Intermittent flooding may occur along the ephemeral washes and Troy Lake area with temporary ponding and erosion. Portions of the Mojave River channel and riparian areas are located within an identified 100-year floodplain according to FEMA, while reaches further downstream are suspected to be within a 100-year floodplain as characterized by the CDWR awareness floodplain program (CDWR 2010; FEMA 2009). Floodwaters in the Mojave River are typically limited to the channel region (Lines 1996). In addition, no wetlands have been identified within the proposed SEZ according to the NWI (USFWS 2009a).

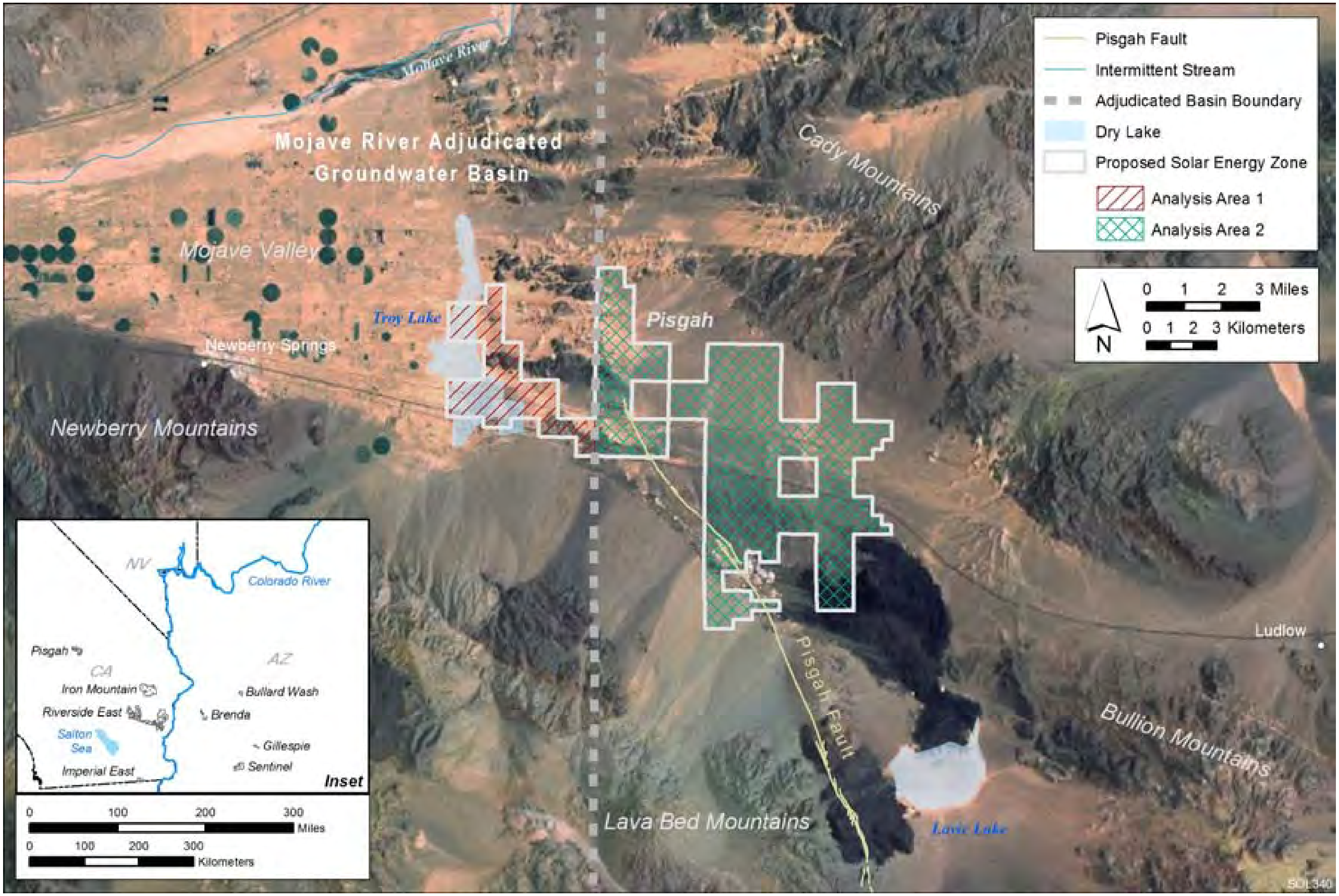

FIGURE 9.3.9.1-1 Surface Water Features near the Proposed Pisgah SEZ

9.3.9.1.2 Groundwater

The proposed Pisgah SEZ is located within two groundwater basins: the Lavic Valley and Lower Mojave River Valley. The Pisgah Fault is suspected to act as a groundwater barrier (CDWR 2003) that separates the two groundwater basins, with 25% of the proposed SEZ's area (western portion) in the Lower Mojave River Valley and 75% of the area (central and eastern portions) located in the Lavic Valley (Figure 9.3.9.1-1). The Lower Mojave Valley groundwater basin consists of alluvial deposits of Quaternary age sediments (CDWR 2003; groundwater basin number 6-40). There are two primary aquifers of the Mojave River: the floodplain and regional aquifers. The floodplain aquifer is typically limited to an area within 1 mi (1.6 km) of the Mojave River channel and consists of highly permeable deposits of sand and gravel on the order of 200 ft (60 m) in thickness. The regional aquifer consists of unconsolidated to partially consolidated sand, silt, and gravel deposits up to 2,000 ft (610 m) in thickness (Stamos et al. 2001; Izbicki 2004). The floodplain aquifer extends from the Mojave River into the proposed SEZ to include Troy Lake. The Lavic Valley groundwater basin consists of alluvial fan and lacustrine deposits of Quaternary age sediments. These deposits consist of unconsolidated sands, pebbles, and boulders with silts and clays in the ephemeral washes above deposits of moderately consolidated gravels, sands, silts, and clays (CDWR 2003; groundwater basin number 7-14). Small regions in the southern portions of the proposed SEZ contain volcanic rocks at the surface originating from the Lavic Lake volcanic field (GVP 2010).

Seepage from the Mojave River is the primary recharge source for the floodplain and regional aquifers of the Lower Mojave groundwater basin. Additional recharge comes from direct precipitation, percolation of runoff from surrounding mountains, irrigation returns, and artificial recharge (CDWR 2003). Estimates of recharge vary depending upon the time frame that was examined, with the average annual recharge to the Lower Mojave Valley groundwater basin estimated to range from 7,400 ac-ft/yr (9 million m^3/yr) to 15,914 ac-ft/yr (19.6 million m^3/yr) for the analysis periods of 1931 to 1990 and 1937 to 1961, respectively (Stamos et al. 2001). The variability in these recharge estimates is caused by the varying groundwater development practices that have occurred in the Mojave River area. Estimates of recharge for the Lavic Valley groundwater basin are not as well quantified because of the lack of development in this region. The natural recharge is estimated to be approximately 300 ac-ft/yr (0.4 million m^3/yr) for the Lavic Valley region (CDWR 2003).

Groundwater withdrawals in the Lower Mojave Valley groundwater basin have been primarily used to support agriculture dating back to the early 1900s. In 1931, groundwater withdrawals were approximately 5,000 ac-ft/yr (6.1 million m^3/yr), quickly rose to around 50,000 ac-ft/yr (61.7 million m^3/yr) in the mid-1960s, and reached a maximum of 60,000 ac-ft/yr (74 million m^3/yr) in the mid-1990s (Stamos et al. 2001). Groundwater withdrawals are currently limited to less than 40,000 ac-ft/yr (49 million m^3/yr), and this limit is decreasing because of groundwater management by adjudication (MWA 2009; see Section 9.3.9.1.3 for further details). Additionally, groundwater discharge by evapotranspiration and underflow are estimated to be approximately 1,000 ac-ft/yr (1.2 million m^3/yr) each for the Lower Mojave Valley groundwater basin based on a groundwater model for 1994 conditions (Stamos et al. 2001). Groundwater discharge processes have not been quantified in the Lavic Valley groundwater basin.

Groundwater well yields range from 80 to 140 gpm (303 to 530 L/min) in the Lavic Valley groundwater basin and from 10 to 2,700 gpm (38 to 10,220 L/min), with an average of 480 gpm (1817 L/min), in the Lower Mojave groundwater basin (CDWR 2003). Transmissivity values in the Lower Mojave groundwater basin were modeled as 1,750 to 7,000 ft^2/day (163 to 650 m^2/day) in the floodplain aquifer and between 250 and 2,500 ft^2/day (23 and 232 m^2/day) in the regional aquifer (Stamos et al. 2001). The general groundwater flow pattern in the Lower Mojave Valley groundwater basin is toward the Mojave River channel (CDWR 2003). In pre-development times, groundwater flowed from the regional aquifer to the floodplain aquifer recharging the Mojave River; however, modeling has shown this flow pattern to have reversed from the 1930s to 1990s because of excessive groundwater withdrawal rates (Stamos et al. 2001). Groundwater in the Lavic Valley groundwater basin typically flows toward Lavic Lake (CDWR 2003).

Evidence of groundwater overdraft[3] with decreasing groundwater elevations has been recognized in the Mojave River region since the mid-1950s (MWA 2004). Groundwater surface elevations have declined at rates ranging from 0.8 to 1.3 ft/yr (0.2 to 0.4 m/yr) over the past decade near Troy Lake and are currently around 60 ft (18 m) below the surface (USGS 2009; well numbers 344956116352901, 345001116381701, 345053116344701, 345104116384002, 345109116332401, and 345142116332601). In other portions of the Lower Mojave Valley groundwater basin, groundwater levels currently range between 120 and 160 ft (37 and 49 m) below the surface (MWA 2009). During the period from 1930 to 1945, groundwater elevations were fairly stable, and steady-state conditions (balance in recharge and discharge processes) were assumed to exist in the Lower Mojave Valley groundwater basin (Stamos et al. 2001). The average of the annual groundwater withdrawals during this period was 5,500 ac-ft/yr (6.8 million m^3/yr) and represents a reasonable estimate of the natural safe yield[4] for the basin.

TDS concentrations in the Lower Mojave Valley groundwater basin range from 300 to 2,000 mg/L. Water quality impairments relating to leaking underground fuel tanks exist near Barstow that introduce chemicals such as benzene, toluene, ethylbenzene, and xylene (BTEX), as well as methyl-tertiary-butyl-ether (MTBE) into the groundwater; there are also elevated concentrations of fluoride, boron, and arsenic found in some wells in the basin (CDWR 2003; Mathany and Belitz 2008). TDS concentrations vary across the Lavic Lake groundwater basin, with values around 280 mg/L in the north and values between 1,680 and 1,720 mg/L in the south and east. Additional impairments to groundwater quality have been detected with regard to sulfate and chloride concentrations that exceed drinking water standards (CDWR 2003). For potable water supplies in California, the TDS must be below 500 mg/L and can be as high as 1,500 mg/L for only short periods of time to meet maximum secondary contaminant levels (*California Code*, Title 22, Article 16, Section 64449).

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[3] Groundwater overdraft is the condition where water extractions from an aquifer exceed recharge processes in such excess as to cause substantial and sustained decreases in groundwater flows and groundwater elevations.

[4] Safe yield is the amount of groundwater that can be withdrawn from a groundwater basin over a period of time without exceeding the long-term recharge of the basin or unreasonably affecting the basin’s physical and chemical integrity.

9.3.9.1.3 Water Use and Water Rights Management

In 2005, water withdrawals from surface waters and groundwater in San Bernardino County were 656,900 ac-ft/yr (860 million m^3/yr), of which 57% came from surface waters and 43% came from groundwater. The largest water use category was municipal and domestic supply, at 427,100 ac-ft/yr (527 million m^3/yr). However, the majority of this water is used in the larger cities located in the southwestern portion of San Bernardino County. Agricultural water uses accounted for 167,000 ac-ft/yr (206 million m^3/yr), while industrial and thermoelectric water uses accounted for 29,150 and 33,630 ac-ft/yr (36 million and 41 million m^3/yr), respectively (Kenny et al. 2009). Consumptive water use in the rural areas near the proposed SEZ totaled 26,400 ac-ft/yr (32.5 million m^3/yr) in 2001 with 58% use by agriculture, 24% industrial, and 9% for municipal and recreational uses each (MWA 2004; Baja region).

California uses a "plural" system to manage water resources that consists of a mixture of riparian and prior appropriation doctrines for surface waters, a separate doctrine for groundwater, and pueblo rights (BLM 2001). Several agencies are involved with the management of California's water resources, including federal, state, local, and water/irrigation districts. For example, water rights and water quality are managed by the State Water Board, while the Department of Water Resources manages water conveyance, infrastructure, and flood management (CDWR 2009). Surface water appropriations for nonriparian rights begin with a permit application to the State Water Board and a review process that examines the application's beneficial use, pollution potential, and water quantity availability; the permitting, review, and licensing procedure should not take more than 6 months to complete unless the application is protested (BLM 2001).

Groundwater management in California is primarily implemented at the local level of government through local agencies or ordinances and can also be subject to court adjudications. State statute provides authority and revenue mechanisms to several types of local agencies to provide water for beneficial uses, as well as manage withdrawals in order to prevent overdraft of the aquifers. Local ordinances (typically at the county level) can also be used to manage groundwater resources and have been adopted in 27 counties in California. Many of these local groundwater ordinances are focused on controlling water exports out of the basin through permitting processes. Court adjudications are the strongest form of groundwater management used in California and often result in the creation of a court-appointed "watermaster" agency to manage withdrawals for all users to ensure that the court-determined safe yield is achieved (CDWR 2003).

Approximately 20% of the proposed Pisgah SEZ is located within the boundaries of the Mojave River adjudicated groundwater basin, which is managed by the Mojave Water Agency (MWA), which serves as the watermaster for the basin. The boundary of the MWA jurisdiction is shown in Figure 9.3.9.1-1, and the western portion of the proposed SEZ located in the adjudicated basin is labeled as Analysis Area 1. This portion of the proposed SEZ is located within the Lower Mojave Valley groundwater basin described previously. The groundwater within the MWA boundaries is completely allocated. Thus new groundwater users need to purchase existing water rights or purchase water as a transfer from current water right holders or the MWA; only minimal users that withdrawal less than 10 ac-ft/yr (12,000 m^3/yr) are exempt from the allocations set by adjudication (MWA 2004). A potential complication for solar energy development on the proposed Pisgah SEZ is that the adjudication of the Mojave River groundwater basin does not permit water exports outside of the MWA boundary (*City of Barstow v. City of Adelanto* 1996).

The MWA establishes groundwater allocations for individual subareas of the adjudicated groundwater basin as a percentage of the base annual production (BAP), which was set using groundwater withdrawal rates from 1986 to 1990. The percentage of the BAP allotted to water users in each subarea is reduced year to year in order to slowly bring withdrawal rates down to the safe yield of the basin over time. The portion of the Mojave River adjudicated basin relevant to the proposed SEZ is known as the Baja subarea, where the *production* safe yield[5] is 20,679 ac-ft/yr (25.5 million m^3/yr) and the BAP is 66,157 ac-ft/yr (81.6 million m^3/yr), of which 70% was available for users during the 2007 to 2008 water year; the available percentage has been set to 65% for the 2009 to 2010 water year (MWA 2009).

The MWA has additional water, which is transported via pipeline from the California Aqueduct near Victorville along the Mojave River, available through the California State Water Project; the nearest discharge point is near the town of Newberry Springs, 6 mi (10 km) west of the proposed SEZ (MWA 2009). While the MWA is allotted 75,800 ac-ft/yr (93.5 million m^3/yr) of State Water Project water, it typically only receives 40% of this amount because of limited supply within the State Water Project (MWA 2004). Persistent drought conditions that have occurred recently in California have reduced the SWP allocations to 15% (CDWR 2010a). The MWA has many uses for SWP water, including supplying replacement water for water rights holders who require more than their allotment and selling to non-water right holders. The cost of replacement water was $337 per ac-ft for the 2007 to 2008 water year (MWA 2009).

The entire proposed Pisgah SEZ falls under the management of the San Bernardino County groundwater ordinance (Groundwater Management Act, *Water Code* §§ 10750 et seq.). Any new groundwater wells that withdraw more than 30 ac-ft/yr (37,000 m^3/yr) are subject to a full review process in accordance with the California Environmental Quality Act. The permitting and review process requires the applicant to provide detailed information regarding the groundwater aquifer, including estimated storage capacity, recharge conditions, water quality, and anticipated safe yield. Conditions of approval for the groundwater withdrawal permit may include mitigation actions, as well as the establishment of a groundwater monitoring plan.

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5 Production safe yield as defined by *City of Barstow v. City of Adelanto* (1996):

"The highest average annual amount of water that can be produced from a subarea: (1) over a sequence of years that is representative of long-term average natural water supply to the subarea net of long-term average annual natural outflow from the subarea, (2) under given patterns of production, applied water, return flows, and consumptive use, and (3) without resulting in a long-term net reduction of groundwater in storage in the subarea."

9.3.9.2 Impacts

Potential impacts on water resources related to utility-scale solar energy development include direct and indirect impacts on surface waters and groundwater. Direct impacts occur at the place of origin and at the time of the proposed activity, while indirect impacts occur away from the place of origin or later in time. Impacts on water resources considered in this analysis are the result of land disturbance activities (construction, final developed site plan, as well as off-site activities such as road and transmission line construction) and water use requirements for solar energy technologies that take place during the four project phases: site characterization, construction, normal operations, and decommissioning/reclamation. Both land disturbance and consumptive water use activities can affect groundwater and surface water flows, cause drawdown of groundwater surface elevations, modify natural drainage pathways, obstruct natural recharge zones, and alter surface water–wetland–groundwater connectivity. Water quality can also be degraded through the generation of wastewater, chemical spills, increased erosion and sedimentation, and increased salinity (e.g., by excessive withdrawal from aquifers).

9.3.9.2.1 Land Disturbance Impacts on Water Resources

Impacts related to land disturbance activities from the construction of utility-scale solar energy facilities are described in Section 5.9.1 for the four phases of development; these impacts will be minimized through the implementation of programmatic design features described in Appendix A, Section A.2.2. In addition to the hydrologic evaluation (including identifying 100-year floodplains and jurisdictional waters) described in the design features (Appendix A, Section A.2.2), coordination and permitting with the California Department of Fish and Game (CDFG) would be needed for any proposed alterations of surface water features (both perennial and ephemeral) in accordance with the Lake and Streambed Alteration Program (CDFG 2010c). Land disturbance activities in the vicinity of Troy Lake could potentially disrupt natural drainage patterns of the ephemeral washes and lead to erosion, as well as affecting natural groundwater recharge and discharge properties. Additionally, because of the existing surface slopes, there is potential for increased erosion for the northern regions of the proposed SEZ that are located just off the slopes of the Cady Mountains and the Lava Bed Mountains.

9.3.9.2.2 Water Use Requirements for Solar Energy Technologies

Analysis Assumptions

A detailed description of the water use assumptions for the four utility-scale solar energy technologies (parabolic trough, power tower, dish engine, and PV systems) is presented in Appendix M. Assumptions regarding water use calculations specific to the proposed Pisgah SEZ include the following:

- Water use requirements for solar energy technologies were analyzed for two separate areas: Analysis Areas 1 and 2 (Figure 9.3.9.1-1);

- Analysis Area 1 covers 4,417 acres (18 km^2), and Analysis Area 2 covers 19,533 acres (79 km^2);

- Analysis Area 1 is the portion of the proposed SEZ that is within the Mojave River adjudicated groundwater basin described in Section 9.3.9.1.3;

- On the basis of a total area (both Analysis Areas) between 10,000 and 30,000 acres (40 and 121 km^2), it is assumed that two solar projects could be constructed during the peak construction year;

- Water needed for making concrete would come from an off-site source;

- The maximum land area disturbed for an individual solar facility during the peak construction year is assumed to be 3,000 acres (12 km^2);

- Assumptions on individual facility size and land requirements (Appendix M), along with the assumed number of projects and maximum allowable land disturbance, results in the potential to disturb up to 25% of the total SEZ area during the peak construction year; and

- Water use requirements for hybrid cooling systems are assumed to be on the same order of magnitude as those using dry cooling (see Section 5.9.2.1).

Site Characterization

During site characterization, water would be used mainly for controlling fugitive dust and the workforce potable water supply. Impacts on water resources during this phase of development are expected to be negligible since activities would be limited in area, extent, and duration; water needs could be met by trucking water in from an off-site source.

Construction

Water use estimates during the peak construction year for the various solar energy technologies are presented in Table 9.3.9.2-1. These estimates were based on the assumption that two solar projects could be constructed during the peak construction year (based on the large total area of the proposed SEZ). Because the area of Analysis Area 2 is 19,533 acres (79 km^2), up to two solar facilities with a total of up to 6,000 acres (24 km^2) of land disturbance could be constructed in Analysis Area 2 during the peak construction year if there was no construction in Analysis Area 1. Because the area of Analysis Area 1 is 4,417 acres (18 km^2), it was assumed that up to 3,000 acres (12 km^2) of land disturbance could occur in Analysis Area 1 in the peak construction year and an additional 3,000 acres (12 km^2) of land disturbance could occur in Analysis Area 2.

TABLE 9.3.9.2-1 Estimated Water Requirements during the Peak Construction Year for the Proposed Pisgah SEZ

Activity	Parabolic Trough	Power Tower	Dish Engine	PV
Total Water Use Requirements for Construction of Two Solar Facilities during the Peak Construction Year				
Water use requirements[a]				
Fugitive dust control (ac-ft)[b,c]	1,686	2,530	2,530	2,530
Potable supply for workforce (ac-ft)	148	90	37	19
Total water use requirements (ac-ft)	1,834	2,620	2,567	2,549
Wastewater generated				
Sanitary wastewater (ac-ft)	148	90	37	19
Water Use Requirements for Peak Year Construction of One Solar Energy Facility (Analysis Area 1)				
Water use requirements[a]				
Fugitive dust control (ac-ft)[b,c]	845	1,267	1,267	1,267
Potable supply for workforce (ac-ft)	74	45	19	9
Total water use requirements (ac-ft)	919	1,312	1,286	1,276
Wastewater generated				
Sanitary wastewater (ac-ft)	74	45	19	9

[a] Assumptions of water use for fugitive dust control, potable supply for workforce, and wastewater generation are presented in Appendix M.

[b] Fugitive dust control estimation assumes a local pan evaporation rate of 74 in./yr (188 cm/yr) (Cowherd et al. 1988; WRCC 2010a).

[c] To convert ac-ft to m^3, multiply by 1,234.

During construction, water would be used mainly for controlling fugitive dust and the workforce potable water supply. The water requirements for construction activities could be met by either trucking water to the sites or by using on-site groundwater resources, because there are no significant surface water bodies on the proposed Pisgah SEZ. Water requirements for fugitive dust control could be as high as 2,620 ac-ft/yr (3.2 million m^3/yr) and for the potable workforce supply as high as 148 ac-ft/yr (182,600 m^3/yr). Groundwater wells would have to yield an estimated 1,136 to 1,623 gpm (4,300 to 6,144 L/min) to meet the total estimated construction water requirements. These yields are on the order of large municipal and agricultural production wells (Harter 2003) and are larger than average well yields for both groundwater basins, thus multiple wells would likely be needed in order to obtain the water requirements. In addition, the generation of up to 148 ac-ft/yr (182,600 m^3/yr) of sanitary wastewater would need to be treated either on-site or sent to an off-site facility.

Operations

During operations, water would be required for mirror/panel washing, the workforce potable water supply, and cooling (parabolic trough and power tower only) (Table 9.3.9.2-2). Water needs for cooling are a function of the type of cooling used (dry, hybrid, or wet). Further refinements to water requirements for cooling would result from the percentage of time the option was employed (30 to 60% range assumed) and the power of the system. The differences between the water requirements reported in Table 9.3.9.2-2 for the parabolic trough and power tower technologies are attributable to the assumptions of acreage per MW. As a result, the water usage for the more energy-dense parabolic trough technology is estimated to be almost twice as large as that for the power tower technology.

The water use estimates for solar energy technologies presented in Table 9.3.9.2-2 are listed for full build-out capacity for Analysis Areas 1 and 2 separately. For Analysis Area 1, water needs for mirror/panel washing are estimated to range from 20 to 353 ac-ft/yr (25,000 to 435,000 m^3/yr) and for the workforce potable water supply up to 10 ac-ft/yr (12,000 m^3/yr). Technologies using wet cooling have a total water requirement of up to 10,610 ac-ft/yr (13.1 million m^3/yr), whereas technologies using dry cooling require up to 1,070 ac-ft/yr (1.3 million m^3/yr), approximately a factor of 10 times less than wet cooling. Non-cooled technologies require substantially less water at full build-out capacity at 200 ac-ft/yr (246,700 m^3/yr) for dish engine and 20 ac-ft/yr (25,000 m^3/yr) for PV. For Analysis Area 2, water needs for mirror/panel washing are estimated to range from 87 to 1,563 ac-ft/yr (107,000 to 1.9 million m^3/yr) and for the workforce potable water supply up to 44 ac-ft/yr (54,300 m^3/yr). Technologies using wet cooling have a total water requirement of up to 46,924 ac-ft/yr (57.9 million m^3/yr), whereas technologies using dry cooling require up to 4,732 ac-ft/yr (5.8 million m^3/yr). Similar to Analysis Area 1, non-cooled technologies require substantially less water at full build-out capacity, at 887 ac-ft/yr (1.1 million m^3/yr) for dish engine and 89 ac-ft/yr (109,800 m^3/yr) for PV.

Operations would produce sanitary wastewater and system blowdown water (wet-cooling technologies only) that would need to be treated either on-site or off-site. In Analysis Area 1, the generation of sanitary wastewater is estimated to be as high as 10 ac-ft/yr (12,000 m^3/yr) and wet-cooling system blowdown water as high as 201 ac-ft/yr (248,000 m^3/yr). In Analysis Area 2, the generation of sanitary wastewater is estimated to be as high as 44 ac-ft/yr (54,300 m^3/yr) and wet-cooling system blowdown water as high as 888 ac-ft/yr (1.1 million m^3/yr). Any on-site treatment of wastewater would have to ensure that treatment ponds are effectively lined in order to prevent any groundwater contamination.

The total water requirements for wet-cooling technologies ranges from 1,967 to 10,610 ac-ft/yr (2.4 million to 13.1 million m^3/yr) in Analysis Area 1 (Table 9.3.9.2-2). These water use estimates for wet cooling are on the same order of magnitude as the estimated safe yield, natural recharge rate, and currently available State Water Project replacement water for the Lower Mojave Valley groundwater basin. Additionally, of the current water right allotments in the Baja subarea of the Mojave adjudicated basin, the maximum groundwater production allotment is less than 5,000 ac-ft/yr (6.2 million m^3/yr), with typical production rates between 100 and 1,500 ac-ft/yr (123,000 to 1.9 million m^3/yr) (MWA 2009). Given that the Lower

TABLE 9.3.9.2-2 Estimated Water Requirements during Normal Operations at Full Build-out Capacity at the Proposed Pisgah SEZ

Activity	Parabolic Trough	Power Tower	Dish Engine	PV
Analysis Area 1 (Mojave River Adjudicated Groundwater Basin)				
Full build-out capacity (MW)[a,b]	707	393	393	393
Water use requirements				
Mirror/panel washing (ac-ft/yr)[c,d]	353	196	196	20
Potable supply for workforce (ac-ft/yr)	10	4	4	<1
Dry cooling (ac-ft/yr)[e]	141–707	79–393	NA[f]	NA
Wet cooling (ac-ft/yr)[e]	3,180–10,247	1,767–5,693	NA	NA
Total water use requirements				
Non-cooled technologies (ac-ft/yr)	NA	NA	200	20
Dry-cooled technologies (ac-ft/yr)	504–1,070	279–593	NA	NA
Wet-cooled technologies (ac-ft/yr)	3,543–10,610	1,967–5,893	NA	NA
Wastewater generated				
Blowdown (ac-ft/yr)[g]	201	112	NA	NA
Sanitary wastewater (ac-ft/yr)	10	4	4	<1
Analysis Area 2 (Areas outside MWA Jurisdiction)				
Full build-out capacity (MW)[a,b]	3,125	1,736	1,736	1,736
Water use requirements				
Mirror/panel washing (ac-ft/yr)[c,d]	1,563	868	868	87
Potable supply for workforce (ac-ft/yr)	44	19	19	2
Dry cooling (ac-ft/yr)[e]	625–3,125	347–1,736	NA	NA
Wet cooling (ac-ft/yr)[e]	14,064–45,317	7,813–25,176	NA	NA
Total water use requirements				
Non-cooled technologies (ac-ft/yr)	NA	NA	887	89
Dry-cooled technologies (ac-ft/yr)	2,232–4,732	1,234–2,623	NA	NA
Wet-cooled technologies (ac-ft/yr)	15,671–46,924	8,700–26,063	NA	NA
Wastewater generated				
Blowdown (ac-ft/yr)[g]	888	493	NA	NA
Sanitary wastewater (ac-ft/yr)	44	19	19	2

a Land area for parabolic trough technology was estimated at 5 acres/MW (0.02 km^2/MW); land area for the power tower, dish engine, and PV technologies was estimated at 9 acres/MW (0.04 km^2/MW).

b Water needs are linearly related to power. Water usage for any other size project can be estimated by using multipliers provided in Table M.9-2 (Appendix M).

c Value assumes a usage rate of 0.5 ac-ft/yr/MW for mirror washing for parabolic trough, power tower, and dish engine technologies and a rate of 0.05 ac-ft/yr/MW for panel washing for PV systems.

d To convert ac-ft to m^3, multiply by 1,234.

e Dry-cooling value assumes 0.2 to 1.0 ac ft/yr per MW and wet-cooling value assumes 4.5 to 14.5 ac ft/yr per MW (range in these values represents 30 and 60% operating times) (DOE 2009).

f NA = not applicable.

g Value scaled from 250-MW Beacon Solar project with an annual discharge of 44 gpm (167 L/min) (AECOM 2009). Blowdown estimates are relevant to wet cooling only.

Mojave Valley groundwater basin is already in overdraft and that groundwater allocations will be decreased over time by the MWA, there do not appear to be adequate available water resources to support wet-cooling technologies in Analysis Area 1.

The groundwater resources in Analysis Area 2 have not been fully quantified because of the lack of development in the region historically. However, the estimated recharge for the Lavic Valley groundwater basin is very low at 300 ac-ft/yr (370,000 m^3/yr) and represents only 1 to 3% of the estimated water requirements for wet cooling, which range from 8,700 to 46,924 ac-ft/yr (10.7 million to 57.9 million m^3/yr) (Table 9.3.9.2-2). It is very likely that the required groundwater withdrawal rates needed for wet cooling would generate significant drawdown of the groundwater elevations in the Lavic Valley groundwater basin.

Decommissioning/Reclamation

During decommissioning/reclamation, all surface structures associated with the solar project would be dismantled, and the site reclaimed to its preconstruction state. Activities and water needs during this phase would be similar to those during the construction phase (dust suppression and potable supply for workers) and may also include water to establish vegetation in some areas. However, the total volume of water needed is expected to be less. Because the quantities of water needed during the decommissioning/ reclamation phase would be less than those for construction, impacts on surface and groundwater resources also would be less.

9.3.9.2.3 Off-Site Impacts: Roads and Transmission Lines

Impacts associated with the construction of roads and transmission lines primarily deal with water use demands for construction, water quality concerns relating to potential chemical spills, and land disturbance effects on the natural hydrology. A new access road would not be needed because I-40 runs east–west along the southern edge and then through the Pisgah SEZ, as described in Section 9.3.1.1. It is assumed that existing transmission lines could provide access to the transmission grid, and thus no additional acreage disturbance for transmission line access was assessed.

9.3.9.2.4 Summary of Impacts on Water Resources

The impacts on water resources associated with developing solar energy in the proposed Pisgah SEZ are associated with land disturbance effects on natural hydrology, water quality concerns, and water use requirements for the various solar energy technologies. Land disturbance impacts can cause localized ponding and erosion, especially in the areas near Troy Lake and the northern portions of the proposed SEZ near the base of the Cady and Lava Bed Mountains. Water quality concerns specific to the proposed SEZ deal with contamination of groundwater through surface spills and with potable water supplies meeting California drinking water standards, for which TDS values exceed standards in certain areas of the site.

The groundwater resources available to the proposed Pisgah SEZ are well quantified and strictly managed for the portions of the site within the Mojave River adjudicated groundwater basin (Analysis Area 1; Figure 9.3.9-1), but are not quantified fully for the portions of the site located within the Lavic Valley groundwater basin (Analysis Area 2). Groundwater levels have been decreasing for several decades, and overdraft conditions exist in the aquifers of Analysis Area 1. It is highly likely that any rapid development of groundwater production in Analysis Area 2 would result in declines in groundwater elevations, given the development history and current conditions with respect to groundwater in the adjacent Mojave River adjudicated basin. The consequences of overdraft and decreasing groundwater elevations are of particular concern to minimal groundwater users in the region who typically use groundwater for domestic water supply, as many of these wells are shallow (less than 250 ft [76 m] in depth) (MWA 2008). An additional concern specific to decreasing groundwater elevations is at the Camp Cady Wildlife Area, located 6 mi (10 km) northwest of the proposed SEZ, where groundwater is critical to preserving habitat for the Mohave tui chub fish, a fish species listed as endangered under the Endangered Species Act (see Section 9.3.12.2.1 for further details).

Impacts relating to water use requirements vary depending on the type of solar technology built and, for technologies using cooling systems, the type of cooling (wet, dry, or hybrid). The water use estimates for wet cooling at the proposed Pisgah SEZ are of a magnitude that exceed the physically, and legally, available groundwater resources in Analysis Area 1, and would most likely generate overdraft conditions in Analysis Area 2. Therefore, wet cooling would not be a feasible option for solar energy development at the proposed Pisgah SEZ.

9.3.9.3 SEZ-Specific Design Features and Design Feature Effectiveness

The program for solar energy development on BLM-administered lands will require the programmatic design features given in Appendix A, Section A.2.2, to be implemented, thus mitigating some impacts on water resources. Programmatic design features would focus on coordinating with federal, state, and local agencies that regulate the use of water resources to meet the requirements of permits and approvals needed to obtain water for development, and conducting hydrological studies to characterize the aquifer from which groundwater would be obtained (including drawdown effects, if a new point of diversion is created). The greatest consideration for mitigating water impacts would be in the selection of solar technologies. The mitigation of impacts would be best achieved by selecting technologies with low water demands.

Proposed design features specific to the proposed Pisgah SEZ include the following:

- Water resource analysis indicates that wet-cooling options would not be feasible. Other technologies should incorporate water conservation measures.

- Land disturbance activities should avoid impacts to the extent possible in the vicinity of Troy Lake and ephemeral washes onsite.

- During site characterization, hydrologic investigations would need to identify 100-year floodplains and potential jurisdictional water bodies subject to Clean

Water Act Section 404 permitting. Siting of solar facilities and construction activities should avoid areas identified as within a 100-year floodplain.

- During site characterization, coordination and permitting with CDFG regarding California's Lake and Streambed Alteration Program would be required for any proposed alterations to surface water features (both perennial and ephemeral).

- Groundwater should be used in accordance with rules and regulations set forth by the MWA regarding the Mojave River adjudicated groundwater basin for the portions of the SEZ located in Analysis Area 1.

- The groundwater-permitting process should be in compliance with the San Bernardino County groundwater ordinance.

- Groundwater monitoring and production wells should be constructed in accordance with standards set forth by the State of California (CDWR 1991) and San Bernardino County.

- Stormwater management best management practices should be implemented according to the California Stormwater Quality Association (CASQA 2003).

- Water for potable uses would have to meet or be treated to meet water quality standards in the California Safe Drinking Water Act (*California Health and Safety Code*, Chapter 4).

9.3.10 Vegetation

This section addresses vegetation that could occur or is known to occur within the potentially affected *area of the proposed Pisgah SEZ.* The affected area considered in this assessment included the areas of direct and indirect effects. The area of direct effects was defined as the area that would be physically modified during project development (i.e., where ground-disturbing activities would occur) and included only the SEZ. The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary where ground-disturbing activities would not occur but that could be indirectly affected by activities in the area of direct effects. No area of direct or indirect effects was assumed for new transmission lines or access roads; they are not expected to be needed for development on the Pisgah SEZ because of the proximity of an existing transmission line and highway.

Indirect effects considered in the assessment included effects from surface runoff, dust, and accidental spills from the SEZ, but not ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance from the SEZ. This area of indirect effects was identified on the basis of professional judgment and was considered sufficiently large to bound the area that would potentially be subject to indirect effects. The affected area is the area bounded by the areas of direct and indirect effects. These areas are defined and the impact assessment approach is described in Appendix M.

9.3.10.1 Affected Environment

The proposed Pisgah SEZ is located within the Mojave Basin and Range Level III ecoregion, which primarily supports creosotebush (*Larrea tridentata*) habitats (EPA 2007). This ecoregion is characterized by broad basins and scattered mountains. Communities of sparse, scattered shrubs and grasses including creosotebush, white bursage (*Ambrosia dumosa*), and big galleta grass (*Pleuraphis rigida*) occur in basins; Joshua tree (*Yucca brevifolia*), other Yucca species, and cacti occur on arid footslopes; woodland and shrubland communities occur on mountain slopes, ridges, and hills (Bryce et al. 2003). Creosotebush, all-scale (*Atriplex polycarpa*), brittlebush (*Encelia farinosa*), desert holly (*Atriplex hymenelytra*), white burrobrush (*Hymenoclea salsola*), shadscale (*Atriplex confertifolia*), blackbrush (*Coleogyne ramosissima*), and Joshua tree (*Yucca brevifolia*) are dominant species within the Mojave desertscrub biome (Turner 1994). Annual precipitation in the Mojave Desert, occurring primarily in winter, is very low in the area of the SEZ, averaging about 3.8 in. (98 mm) at the Daggett Airport (see Section 9.3.13). Many ephemeral species (winter annuals) germinate in response to winter rains (Turner 1994).

Land cover types, described and mapped under CAReGAP (NatureServe 2010), were used to evaluate plant communities in and near the SEZ. Each cover type encompasses a range of similar plant communities. Land cover types occurring within the potentially affected area of the proposed Pisgah SEZ are shown in Figure 9.3.10.1-1. Table 9.3.10.1-1 provides the surface area of each cover type within the potentially affected area.

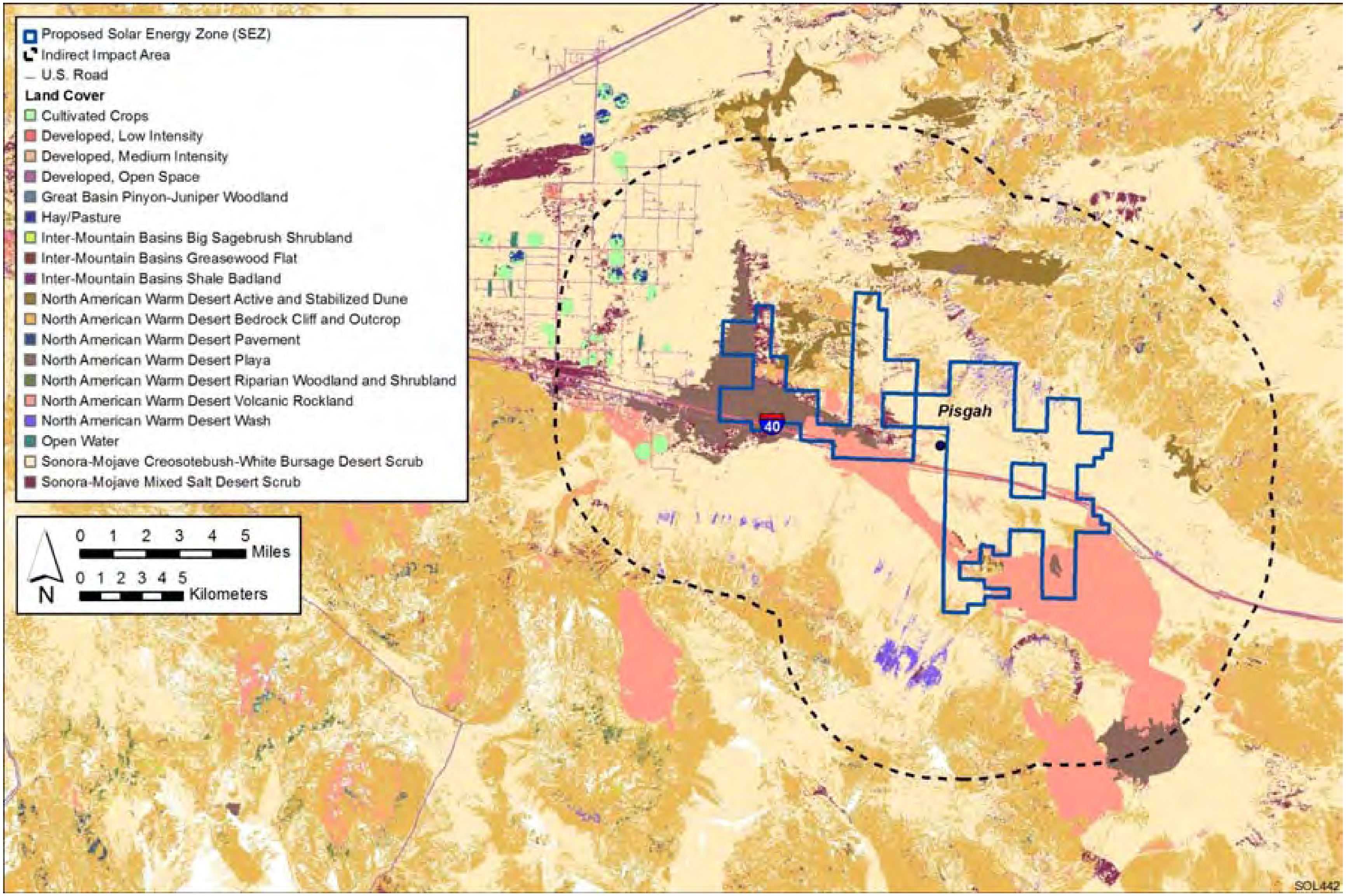

FIGURE 9.3.10.1-1 Land Cover Types within the Proposed Pisgah SEZ (Source: NatureServe 2010)

TABLE 9.3.10.1-1 Land Cover Types within the Potentially Affected Area of the Proposed Pisgah SEZ and Potential Impacts

	Area of Cover Type Affected (acres)[b]		
Land Cover Type[a]	Within SEZ[c] (Direct Effects)	Outside SEZ[d] (Indirect Effects)	Overall Impact Magnitude[e]
5264 Sonora-Mojave Creosotebush–White Bursage Desert Scrub: Occurs in broad valleys, lower bajadas, plains, and low hills in the Mojave and Sonoran Deserts. Shrubs form a sparse to moderately dense cover (2 to 50%), although the ground surface may be mostly barren. The dominant species are typically creosotebush (*Larrea tridentata*) and white bursage (*Ambrosia dumosa*). Other shrubs, dwarf-shrubs, and cacti may also be dominant or form sparse understories. Herbaceous species are typically sparse, but may be seasonally abundant.	14,548 acres[f] (0.6%, 1.4%)	156,519 acres (4.4%)	Small
3180 North American Warm Desert Volcanic Rockland: Consists of barren and sparsely vegetated (<10% plant cover) areas. Vegetation is variable and typically includes scattered desert shrubs.	3,193 acres (3.2%, 7.1%)	16,511 acres (16.4%)	Moderate
3161 North American Warm Desert Playa: Consists of barren and sparsely vegetated areas (generally <10% plant cover) that are intermittently flooded; salt crusts are common. Sparse shrubs occur around the margins, and patches of grass may form in depressions. In large playas, vegetation forms rings in response to salinity. Herbaceous species may be periodically abundant.	2,795 acres (2.6%, 6.1%)	4,767 acres (4.4%)	Moderate
3120 North American Warm Desert Bedrock Cliff and Outcrop: Occurs on subalpine to foothill steep cliff faces, narrow canyons, rock outcrops, unstable scree, and talus slopes. Consists of barren and sparsely vegetated areas (generally <10% plant cover) with desert species, especially succulents. Lichens are predominant in some areas.	1,505 acres (0.1%, 0.2%)	41,062 acres (3.2%)	Small
5265 Sonora-Mojave Mixed Salt Desert Scrub: Extensive open-canopied shrublands in the Mojave and Sonoran Deserts, usually occurring around playas and in valley bottoms or basins with saline soils. Vegetation typically comprises one or more *Atriplex* species; other salt-tolerant plants are often present or even co-dominant. Grasses occur at various densities.	879 acres (0.5%, 1.6%)	3,769 acres (2.0%)	Small

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TABLE 9.3.10.1-1 (Cont.)

Land Cover Type[a]	Area of Cover Type Affected (acres)[b] Within SEZ[c] (Direct Effects)	Outside SEZ[d] (Indirect Effects)	Overall Impact Magnitude[e]
3121 North American Warm Desert Active and Stabilized Dune: Consists of unvegetated to sparsely vegetated (generally <10% plant cover) active dunes and sand sheets. Vegetation includes shrubs, forbs, and grasses. Includes unvegetated "blowouts" and stabilized areas.	322 acres (0.2%, 1.3%)	5,155 acres (3.5%)	Small
9151 North American Warm Desert Wash: Consists of intermittently flooded linear or braided strips within desert scrub or grassland landscapes on bajadas, mesas, plains, and basin floors. Although often dry, washes are associated with rapid sheet and gully flow. The vegetation varies from sparse and patchy to moderately dense and typically occurs along the banks, but may occur within the channel. Shrubs and small trees are typically intermittent to open. Common upland shrubs often occur along the edges.	244 acres (0.3%, 0.8%)	1,907 acres (2.3%)	Small
23, 24 Developed, Medium-High Density: Includes housing and commercial/industrial development. Impervious surfaces compose 50 to 100% of the total land cover.	9 acres (0.2%, 10.2%)	28 acres (0.5%)	Small
3139 Inter-Mountain Basins Shale Badland: Typically occurs on rounded hills and plains. Consists of barren and sparsely vegetated areas (<10% plant cover) with high rate of erosion and deposition. Vegetation consists of sparse dwarf shrubs and herbaceous plants.	6 acres (0.1%, 0.2%)	159 acres (1.8%)	Small
3143 North American Warm Desert Pavement: Consists of unvegetated to very sparsely vegetated (<2% plant cover) areas, usually in flat basins, with ground surfaces of fine to medium gravel coated with "desert varnish." Desert scrub species are usually present. Herbaceous species may be abundant in response to seasonal precipitation.	3 acres (<0.1%, <0.1%)	455 acres (2.3%)	Small

TABLE 9.3.10.1-1 (Cont.)

Land Cover Type[a]	Area of Cover Type Affected (acres)[b] Within SEZ[c] (Direct Effects)	Outside SEZ[d] (Indirect Effects)	Overall Impact Magnitude[e]
5259 Mojave Mid-Elevation Mixed Desert Scrub: The vegetation composition is quite variable. Dominant species include shrubs forbs and grasses and may include *Yucca* spp.	0 acres	2,816 acres (0.7%)	Small
81, 82 Hay/Pasture, Cultivated Crops: Areas where pasture/hay or cultivated crops account for more than 20% of total vegetation cover.	0 acres	1,182 acres (13.2%)	Small
9182 North American Warm Desert Riparian Woodland and Shrubland: Occurs along medium to large perennial streams in canyons and desert valleys. Consists of a mix of riparian woodlands and shrublands. Vegetation is dependent upon annual or periodic flooding, along with substrate scouring, and/or a seasonally shallow water table.	0 acres	56 acres (0.9%)	Small
11 Open Water: Plant or soil cover is generally less than 25%.	0 acres	47 acres (8.4%)	Small
9178 North American Warm Desert Riparian Mesquite Bosque: Occurs along perennial and intermittent streams as relatively dense riparian corridors composed of trees and shrubs. Honey mesquite (*Prosopis glandulosa*) and velvet mesquite (*P. velutina*) are the dominant trees. Vegetation is supported by groundwater when surface water is absent.	0 acres	12 acres (0.2%)	Small
5207 Inter-Mountain Basins Big Sagebrush Shrubland: Dominated by basin big sagebrush (*Artemisia tridentata tridentata*), Wyoming big sagebrush (*Artemisia tridentata wyomingensis*), or both. Other shrubs may be present. Perennial herbaceous plants are present but not abundant.	0 acres	9 acres (0.1%)	Small

TABLE 9.3.10.1-1 (Cont.)

Land Cover Type[a]	Area of Cover Type Affected (acres)[b] Within SEZ[c] (Direct Effects)	Outside SEZ[d] (Indirect Effects)	Overall Impact Magnitude[e]
9103 Inter-Mountain Basins Greasewood Flat: Dominated or co-dominated by greasewood (*Sarcobatus vermiculatus*) and generally occurring in areas with saline soils, a shallow water table, and intermittent flooding, although remaining dry for most growing seasons. This community type generally occurs near drainages or around playas. These areas may include or be co-dominated by other shrubs and include a graminoid herbaceous layer.	0 acres	1 acre (0.1%)	Small

[a] Land cover descriptions are from NatureServe (2010). Full descriptions of land cover types, including plant species, can be found in Appendix I.

[b] Area in acres, determined from Sanborn Mapping (2008),

[c] Includes the area of the cover type within the SEZ, the percentage that area represents of all occurrences of that cover type within the SEZ region (i.e., a 50-mi [80-km] radius from the center of the SEZ), and the percentage that area represents of all occurrences of that cover type on BLM lands within the SEZ region.

[d] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary where ground-disturbing activities would not occur. Indirect effects include effects from surface runoff, dust, and other factors from project facilities. The potential degree of indirect effects would decrease with increasing distance from the SEZ. Includes the area of the cover type within the indirect effects area and the percentage that area represents of all occurrences of that cover type within the SEZ region.

[e] Overall impact magnitude categories were based on professional judgment and were (1) *small*: a relatively small proportion ($\leq$1%) of the cover type within the SEZ region would be lost; (2) *moderate*: an intermediate proportion (>1 but $\leq$10%) of a cover type would be lost; (3) *large*: >10% of a cover type would be lost.

[f] To convert acres to km^2, multiply by 0.004047.

Lands within the Pisgah SEZ are classified primarily as Sonora-Mojave Creosotebush-White Bursage Desert Scrub. Additional cover types within the SEZ are given in Table 9.3.10.2-1. Creosotebush and white burrobrush were observed to be the dominant species over much of the SEZ in August 2009. Sensitive habitats on the SEZ include playa, sand dune, desert dry wash, and desert chenopod scrub/mixed salt desert scrub habitats.

The area surrounding the SEZ, within 5 mi (8 km), includes 14 cover types, which are listed in Table 9.3.10.1-1. The predominant cover types are Sonora-Mojave Creosotebush-White Bursage Desert Scrub and North American Warm Desert Bedrock Cliff and Outcrop.

There are no wetlands mapped by the NWI that occur within the SEZ or within the 5-mi (8-km) area of indirect effects. NWI maps are produced from high-altitude imagery and are subject to uncertainties inherent in image interpretation (USFWS 2009a). Troy Lake, a dry lakebed located in the western portion of Pisgah, occasionally holds shallow surface water and is sparsely vegetated. Troy Lake is primarily classified as North American Warm Desert Playa. Species occurring on the lakebed include white burrobush and saltbush (*Atriplex* sp.). In addition, a number of areas in the SEZ temporarily hold surface water after storms. These areas typically have a hard, cracked substrate and are often unvegetated. Tamarisk, a nonnative invasive tree or tall shrub, occurs in low areas that occasionally collect stormwater, such as along railroad embankments. Numerous ephemeral dry washes occur within the SEZ. These dry washes typically contain water for short periods during or following precipitation events, and include temporarily flooded areas, but typically do not support wetland or riparian habitats.

The proposed Pisgah SEZ is located within the MWMA. Table 9.3.10.1-2 lists problem weed species of the MWMA. Invasive species known to occur within the SEZ include tamarisk, which occurs along wet areas, Sahara mustard, and shizmus (*Schismus arabicus*). Tamarisk and Sahara mustard are included on the MWMA weed list.

9.3.10.2 Impacts

The construction of solar energy facilities within the Pisgah SEZ would result in direct impacts on plant communities because of the removal of vegetation within the facility footprint during land-clearing and land-grading operations. Approximately 80% of the SEZ (19,160 acres [77.5 km^2]) would be expected to be cleared with full development of the SEZ. The plant communities affected would depend on facility locations and could include any of the communities occurring on the SEZ. Therefore, for this analysis, all the area of each cover type within the SEZ is considered to be directly affected by removal with full development of the SEZ.

Indirect effects (e.g., caused by surface runoff or dust from the SEZ) have the potential to degrade affected plant communities and may reduce biodiversity by promoting the decline or elimination of species sensitive to disturbance. Indirect effects can also cause an increase in disturbance-tolerant species or invasive species. High impact levels could result in the elimination of a community or the replacement of one community type by another. The

TABLE 9.3.10.1-2 Problem Weeds of the MWMA

Common Name	Scientific Name
Tamarisk	*Tamarix ramosissima*
Halogeton	*Halogeton glomeratus*
White horsenettle,	*Solanum elaeagnifolium*
Yellow starthistle	*Centaurea solstitialis*
Dalmatian toadflax	*Linaria dalmatica*
Russian thistle	*Salsola tragus*
Puncture vine	*Tribulus terrestris*
Camelthorn	*Alhagi maurorum*
Giant reed	*Arundo donax*
Sahara mustard	*Brassica tournefortii*
Red brome	*Bromus madritensis* ssp. *rubens*
Fountain grass	*Pennisetum setaceum*
Tree of heaven	*Ailanthus altissima*
Perennial peppercress[a]	*Lepidium latifolium*
Spanish broom[a]	*Spartium junceum*

[a] Additional species are identified in MWMA (2008).

Source: MWMA (2002).

proper implementation of design features, however, would reduce indirect effects to a minor or small level of impact.

Possible impacts from solar energy facilities on vegetation that are encountered within the SEZ, as well as general mitigation measures, are described in more detail in Section 5.10.5. Any such impacts will be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2 (selected from the general mitigation measures), and from any additional mitigations applied. Design features specific to the proposed Pisgah SEZ are described in Section 9.3.10.3.

9.3.10.2.1 Impacts on Native Species

The impacts of construction, operation, and decommissioning were considered small if the impact affected a relatively small proportion (<1%) of the cover type in the SEZ region (within 50 mi [80 km] of the center of the SEZ); moderate if it could affect an intermediate proportion (>1 but <10%) of the cover type; and large if it could affect greater than 10% of the cover type.

Solar facility construction and operation would primarily affect communities of the Sonora-Mojave Creosotebush-White Bursage Desert Scrub cover type. Additional cover types within the SEZ that would be affected include North American Warm Desert Volcanic Rockland, North American Warm Desert Playa, North American Warm Desert Bedrock Cliff and Outcrop, Sonora-Mojave Mixed Salt Desert Scrub, North American Warm Desert Active and Stabilized Dune, North American Warm Desert Wash, Inter-Mountain Basins Shale Badland, North American Warm Desert Pavement. Although Developed, Open Space–Low Intensity and Developed, Medium-High Density cover types occur within the SEZ, these developed areas likely support few native plant communities. The potential impacts on native species cover types resulting from solar energy facilities in the proposed Pisgah SEZ are summarized in Table 9.3.10.2-1. Many of these cover types are relatively common in the SEZ region; however, Inter-Mountain Basins Shale Badland and North American Warm Desert Pavement are relatively uncommon, representing 0.2 and 0.4%, respectively, of the land area within the SEZ region. Sand dune, playa, chenopod scrub/mixed salt desert scrub, riparian, and dry wash communities are important sensitive habitats in the region.

The construction, operation, and decommissioning of solar projects within the SEZ would result in moderate impacts on North American Warm Desert Volcanic Rockland and North American Warm Desert Playa. Much of the playa cover type is associated with Troy Lake. Solar project development within the SEZ would result in small impacts on the remaining cover types in the affected area.

Disturbance of vegetation in dune communities within the SEZ, as by heavy equipment operation, could result in the loss of substrate stabilization. Re-establishment of dune species could be difficult due to the arid conditions and unstable substrates. Because of the arid conditions, reestablishment of desert scrub or other communities in temporarily disturbed areas would likely be very difficult and might require extended periods of time. In addition, noxious weeds could become established in disturbed areas and could colonize adjacent undisturbed habitats, thus reducing restoration success and potentially resulting in widespread habitat degradation. Cryptogamic soil crusts occur in many of the shrubland communities in the region, and likely occur on the SEZ. Damage to these crusts, caused by the operation of heavy equipment or other vehicles, can alter important soil characteristics, such as nutrient cycling and availability, and affect plant community characteristics (Lovich and Bainbridge 1999).

Communities associated with playa habitats or other intermittently flooded areas within or downgradient from solar projects could be affected by ground-disturbing activities. Riparian habitats, mesquite bosque, and greasewood communities outside the SEZ could also be affected. Site-clearing and site-grading could affect community function and disrupt surface water or groundwater flow patterns, resulting in changes in the frequency, duration, depth, or extent of inundation or soil saturation, and could potentially alter playa communities, riparian habitats, mesquite bosque, and greasewood communities, including occurrences outside of the SEZ. Increases in surface runoff from a solar energy project site could also affect hydrologic characteristics of these communities. The introduction of contaminants into these habitats could result from spills of fuels or other materials used on a project site. Soil disturbance could result in sedimentation in these areas, which could degrade or eliminate sensitive plant communities. Grading could also affect dry washes within the SEZ, and alteration of surface drainage patterns or hydrology could adversely affect downstream dry wash communities. Vegetation within these communities could be lost by erosion or desiccation. See Section 9.3.9 for further discussion of impacts on washes.

The deposition of fugitive dust from disturbed soil areas in habitats outside a solar project area could result in reduced productivity or changes in plant community composition. Fugitive dust deposition could affect plant communities of each of the cover types occurring within the indirect effects area identified in Table 9.3.10.1-1.

Although the use of groundwater within the Pisgah SEZ for technologies with high water requirements, such as wet-cooling systems, is considered unlikely, groundwater withdrawals for such systems near Troy Lake playa could contribute to the further depletion of the Lower Mojave Valley regional groundwater system (see Sections 9.3.9.1.2 and 9.3.12.2.1). Reductions in groundwater discharges at springs and seeps along the Mojave River that support riparian habitats could result in further degradation of these habitats. Communities that depend on accessible groundwater, such as mesquite bosque communities, could also become degraded or lost as a result of lowered groundwater levels.

9.3.10.2.2 Impacts from Noxious Weeds and Invasive Plant Species

E.O. 13112, "Invasive Species," directs federal agencies to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts of invasive species (*Federal Register*, Vol. 64, page 61836, Feb. 8, 1999). Potential impacts of noxious weeds and invasive plant species resulting from solar energy facilities are described in Section 5.10.1. Despite programmatic design features required to prevent the spread of noxious weeds, project disturbance could potentially increase the prevalence of noxious weeds and invasive species in the affected area of the proposed Pisgah SEZ and increase the probability that weeds could be transported into areas that were previously relatively weed-free. This could result in reduced restoration success and possible widespread habitat degradation.

Noxious weeds, including tamarisk, Sahara mustard, and shizmus occur on the SEZ. Additional species known to occur in the MWMA are given in Table 9.3.10.1-2.

Past or present land uses may affect the susceptibility of plant communities to the establishment of noxious weeds and invasive species. Small areas of Developed, Open Space–Low Intensity, totaling about 430 acres (1.7 km^2), occur within the SEZ, and approximately 2,237 acres (9.1 km^2) occurs in the indirect effects area. About 9 acres (0.04 km^2) of Developed, Medium-High Density occurs within the SEZ, and 28 acres (0.1 km^2) occurs within the indirect effects area. The developed areas likely support few native plant communities. Because disturbance may promote the establishment and spread of invasive species, developed areas may provide sources of such species. Existing roads, rail lines, transmission lines, and recreational OHV use within the SEZ region also likely contribute to the susceptibility of plant communities to the establishment and spread of noxious weeds and invasive species.

9.3.10.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A, Section A.2.2, would reduce the potential for impacts on plant communities. While some SEZ-specific design features are best established when considering specific project details, design features that can be identified at this time include the following:

- An Integrated Vegetation Management Plan, addressing invasive species control, and an Ecological Resources Mitigation and Monitoring Plan, addressing habitat restoration, should be approved and implemented to increase the potential for successful restoration of creosotebush–white bursage desert scrub communities and other affected habitats and to minimize the potential for the spread of tamarisk, Sahara mustard, schismus, or other invasive species. Invasive species control should focus on biological and mechanical methods to reduce the use of herbicides.

- All playa, chenopod scrub, sand dune and sand transport areas, and desert dry wash habitats, shall be avoided to the extent practicable, and any impacts minimized and mitigated. A buffer area shall be maintained around riparian areas, playas, and dry washes to reduce the potential for impacts on these habitats on or near the SEZ. Appropriate engineering controls shall be used to minimize impacts on these areas resulting from surface water runoff, erosion, sedimentation, altered hydrology, accidental spills, or fugitive dust deposition to these habitats. Appropriate buffers and engineering controls would be determined through agency consultation.

- Groundwater withdrawals should be prohibited to avoid the potential for indirect impacts on riparian habitat along the Mojave River or groundwater-dependent communities such as mesquite bosque.

If these SEZ-specific design features are implemented in addition to programmatic design features, it is anticipated that a high potential for impacts from invasive species and potential impacts on riparian, mesquite bosque, playa, chenopod scrub, sand dune, and dry wash habitat would be reduced to a minimal potential for impact.

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9.3.11 Wildlife and Aquatic Biota

This section addresses wildlife (amphibians, reptiles, birds, and mammals) and aquatic biota that could occur within the potentially affected area of the proposed Pisgah SEZ. Wildlife known to occur within 50 mi (80 km) of the SEZ (i.e., the SEZ region) were determined from the California Wildlife Habitat Relationships System (CDFG 2008). Land cover types suitable for each species were determined from the Southwest Regional Gap Analysis Program (SWReGAP) (USGS 2004, 2005, 2007). The amount of aquatic habitat within the SEZ region was determined by estimating the length of linear perennial stream and canal features and the area of standing water body features (i.e., ponds, lakes, and reservoirs) within 50 mi (80 km) of the SEZ by using available geographic information system (GIS) surface water datasets.

The affected area considered in this assessment included the areas of direct and indirect effects. The area of direct effects was defined as the area that would be physically modified during project development (i.e., where ground-disturbing activities would occur within the SEZ). The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary where ground-disturbing activities would not occur but that could be indirectly affected by activities in the area of direct effects (e.g., surface runoff, dust, noise, lighting, and accidental spills from the SEZ). The potential degree of indirect effects would decrease with increasing distance from the SEZ. This area of indirect effects was identified on the basis of professional judgment and was considered sufficiently large to bound the area that would potentially be subject to indirect effects.

The affected area is the area bounded by the areas of direct and indirect effects. These areas are defined and the impact assessment approach is described in Appendix M. Due to the proximity of existing infrastructure, the impacts of construction and operation of transmission lines outside of the SEZ are not assessed, assuming that the existing transmission might be used to connect some new solar facilities to load centers and that additional project-specific analysis would be conducted for new transmission construction or line upgrades. Similarly, the impacts of construction or upgrades to access roads were not assessed for this SEZ due to the proximity of the existing state highway (see Section 9.3.1.2 for a discussion of development assumptions for this SEZ).

Dominant vegetation in the affected area is Mojave Desertscrub, and the primary land cover habitat type within the affected area is Sonora–Mojave creosotebush–white bursage desertscrub (see Section 9.3.10). Potentially unique habitats in the affected area in which wildlife species may reside include desert dunes, cliffs and rock outcrops, volcanic rocklands, desert washes, and playa wetland habitats. Playa wetland habitats in the affected area include the Troy Lake and Lavic Lake playas. The Troy Lake playa occurs in the western portion of the SEZ; Lavic Lake occurs outside of the SEZ but within the area of indirect effects approximately 4 mi (6 km) southeast of the SEZ. The Mojave River occurs outside of the affected area but flows as near as 7 mi (11 km) northwest of the SEZ (Figure 9.3.12.1-1).

9.3.11.1 Amphibians and Reptiles

9.3.11.1.1 Affected Environment

This section addresses amphibian and reptile species that are known to occur, or for which potentially suitable habitat occurs, on or within the potentially affected area of the proposed Pisgah SEZ. The list of amphibian and reptile species potentially present in the project area was determined from range maps and habitat information available from the California Wildlife Habitat Relationships System (CWHES) (CDFG 2008). Land cover types suitable for each species were determined from the SWReGAP (USGS 2004, 2005, 2007). See Appendix M for additional information on the approach used.

Based on the range, habitat preferences, and/or presence of potentially suitable land cover for the amphibian species that occur within southeastern California (CDFG 2008; USGS 2004, 2005, 2007), the red-spotted toad (*Bufo punctatus*) would be expected to occur within the proposed Pisgah SEZ. However, because it prefers dry, rocky areas near temporary sources of standing water, its occurrence within the SEZ would be spatially limited. It would most likely occur in the far western portion of the SEZ that overlaps portions of Troy Lake.

Thirty reptile species could occur within the proposed Pisgah SEZ (CDFG 2008). These species include 1 tortoise, 13 lizards, and 16 snakes. The desert tortoise (*Gopherus agassizii*) is a federally and state-listed threatened species. This species is discussed in Section 9.3.12. Among the more common lizard species that could occur within the SEZ are the desert horned lizard (*Phrynosoma platyrhinos*), long-nosed leopard lizard (*Gambelia wislizenii*), Mojave fringe-toed lizard (*Uma scoparia*), side-blotched lizard (*Uta stansburiana*), western banded gecko (*Coleonyx variegatus*), and zebra-tailed lizard (*Callisaurus draconoides*).

The most common snake species expected to occur within the proposed Pisgah SEZ are the coachwhip (*Masticophis flagellum*), glossy snake (*Arizona elegans*), gophersnake (*Pituophis catenifer*), groundsnake (*Sonora semiannulata*), and long-nosed snake (*Rhinocheilus lecontei*). The Mojave rattlesnake (*Crotalus scutulatus*) and sidewinder (*C. cerastes*) would be the most common poisonous snake species expected to occur on the SEZ.

Table 9.3.11.1-1 provides habitat information for the representative amphibian and reptile species that could occur on or in the affected area of the proposed Pisgah SEZ.

9.3.11.1.2 Impacts

The potential for impacts on amphibians and reptiles from utility-scale solar energy development within the proposed Pisgah SEZ is presented in this section. The types of impacts that amphibians and reptiles could incur from construction, operation, and decommissioning of utility-scale solar energy facilities are discussed in Section 5.10.2.1. Any such impacts would be minimized through the implementation of required programmatic design features described in

Appendix A, Section A.2.2, and through any additional mitigation applied. Section 9.3.11.1.3 identifies SEZ-specific design features of particular relevance to the proposed Pisgah SEZ.

The assessment of impacts on amphibians and reptile species is based on available information on the presence of species in the affected area as presented in Section 9.3.11.1.1, following the analysis approach described in Appendix M. Additional NEPA assessments and coordination with state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid or mitigate impacts on amphibians and reptiles (see Section 9.3.11.1.3).

In general, impacts on amphibians and reptiles would result from habitat disturbance (i.e., habitat reduction, fragmentation, and alteration) and from disturbance, injury, or mortality to individual amphibians and reptiles. On the basis of the impacts on amphibians and reptiles summarized in Table 9.3.11.1-1, direct impacts on amphibian and reptile species would be small, because only 0.2 to 0.6% of potentially suitable habitats identified for the species in the SEZ region would be lost. Larger areas of potentially suitable habitats for the amphibian and reptile species occur within the area of potential indirect effects (e.g., up to 5.7% of available habitat for the long-nosed leopard lizard). Other impacts on amphibians and reptiles could result from surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, accidental spills, collection, and harassment. These indirect impacts are expected to be negligible with implementation of programmatic design features.

Decommissioning of facilities and reclamation of disturbed areas after operations cease could result in short-term negative impacts on individuals and habitats adjacent to project areas, but long-term benefits would accrue if suitable habitats were restored in previously disturbed areas. Section 5.10.2.1.4 provides an overview of the impacts of decommissioning and reclamation on wildlife. Of particular importance for amphibian and reptile species would be the restoration of original ground surface contours, soils, and native plant communities associated with semiarid shrublands.

9.3.11.1.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A, Section A.2.2, would reduce the potential for effects on amphibians and reptiles, especially for those species that utilize habitat types that can be avoided (e.g., Troy Lake, which could provide habitat for the red-spotted toad). Indirect impacts could be reduced to negligible levels by implementing programmatic design features, especially those engineering controls that would reduce runoff, sedimentation, spills, and fugitive dust. While SEZ-specific features are best established when considering specific project details, the following SEZ-specific design feature can be identified:

- To the extent practicable, avoid the ephemeral drainages and Troy Lake.

If this SEZ-specific design feature is implemented in addition to other programmatic design features, impacts on amphibian and reptile species could be reduced. Any residual

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TABLE 9.3.11.1-1 Representative Amphibians and Reptiles That Could Occur on or in the Affected Area of the Proposed Pisgah SEZ and Potential Impacts

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a]		Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
		Within SEZ (Direct Effects)[b]	Outside SEZ (Indirect Effects)[c]	
Amphibians				
Red-spotted toad (*Bufo punctatus*)	Rocky canyons and gullies in deserts, grasslands, and dry woodlands. When inactive, it occurs under rocks, in rock crevices, or underground. Often found near rocky areas associated with spring seepages, intermittent streams, and cattle tanks. Breeds in shallow water of temporary rain pools, spring-fed pools, and pools along intermittent streams. About 2,897,500 acres[f] of potentially suitable habitat occurs in the SEZ region.	15,427 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	107,664 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small. Avoid development within Troy Lake.
Lizards				
Desert horned lizard (*Phrynosoma platyrhinos*)	Deserts dominated by sagebrush, creosotebush, greasewood, or cactus. Occurs on sandy flats, alluvial fans, washes, and edge of dunes. Burrows in soil during periods of inactivity. Common throughout Mojave and Colorado Deserts. About 4,648,400 acres of potentially suitable habitat occurs in the SEZ region.	19,160 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	177,758 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	Small. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Long-nosed leopard lizard (*Gambelia wislizenii*)	Desert and semidesert areas with scattered shrubs. Prefers sandy or gravelly flats and plains. Also prefers areas with abundant rodent burrows that it occupies when inactive. Widely distributed in the Mojave, Colorado, and other desert areas in California. About 2,899,700 acres of potentially suitable habitat occurs in the SEZ region.	15,427 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	107,673 acres of potentially suitable habitat (5.7% of available potentially suitable habitat)	Small

TABLE 9.3.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a] Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a] Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Lizards (Cont.)				
Mojave fringe-toed lizard (*Uma scoparia*)	Restricted to sparsely vegetated windblown sand of dunes, flats, riverbanks, and washes. Requires fine, loose sand for burrowing. About 2,448,500 acres of potentially suitable habitat occurs in the SEZ region.	14,870 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat)	106,234 acres of potentially suitable habitat (4.3% of available potentially suitable habitat)	Small
Side-blotched lizard (*Uta stansburiana*)	Arid and semiarid locations with scattered bushes or scrubby trees. Often occurs in sandy washes with scattered rocks and bushes. About 4,075,100 acres of potentially suitable habitat occurs in the SEZ region.	16,297 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	146,864 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	Small
Western banded gecko (*Coleonyx variegatus*)	Wide variety of habitats including deserts with creosotebush and sagebrush and pinyon-juniper woodlands. Inhabits both rocky areas and barren dunes. Most abundant in sandy flats and desert washes. Uses rocks, burrows, and spaces beneath vegetative debris or trash during period of inactivity. About 3,099,200 acres of potentially suitable habitat occurs in the SEZ region.	18,466 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat)	114,406 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small
Zebra-tailed lizard (*Callisaurus draconoides*)	Sparsely vegetated deserts or open sandy washes, dunes, floodplains, beaches, or desert pavement. Common and widely distributed throughout Mojave and Colorado Deserts. About 3,352,300 acres of potentially suitable habitat occurs in the SEZ region.	19,160 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat)	136,527 acres of potentially suitable habitat (4.1% of available potentially suitable habitat)	Small. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 9.3.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Snakes				
Coachwhip (*Masticophis flagellum*)	Wide variety of open terrain habitats. Most abundant in deserts, grasslands, scrub, chaparral, and pastures. Prefers relatively dry open terrain. Seeks cover in burrows, rocks, or vegetation. About 3,751,200 acres of potentially suitable habitat occurs in the SEZ region.	16,375 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	147,306 acres of potentially suitable habitat (3.9% of available potentially suitable habitat)	Small
Glossy snake (*Arizona elegans*)	Variety of habitats including barren to sparsely shrubby deserts, sagebrush flats, grasslands, and sand hills. Prefers sandy areas with scattered brush, but also occurs in rocky areas. Shelters and lays eggs underground. Common throughout southern California, particularly the desert regions. About 2,542,561 acres of potentially suitable habitat occurs in the SEZ region.	15,114 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat)	108,162 acres of potentially suitable habitat (4.3% of available potentially suitable habitat)	Small
Gophersnake (*Pituophis catenifer*)	Wide variety of habitats including deserts, prairies, shrublands, woodlands, and farmlands. May dig its burrow or occupy mammal burrows. Eggs are laid in burrows or under large rocks or logs. Most widespread and common snake in California. About 3,346,600 acres of potentially suitable habitat occurs in the SEZ region.	19,160 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat)	121,835 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	Small. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Groundsnake (*Sonora semiannulata*)	Arid and semiarid areas including desert flats, sand hummocks, rocky hillsides with pockets of loose soil. Ranges from prairie and desert lowlands to pinyon-juniper and oak-pine zone. About 2,729,300 acres of potentially suitable habitat occurs in the SEZ region.	14,548 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	103,972 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	Small

TABLE 9.3.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a]		Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
		Within SEZ (Direct Effects)[b]	Outside SEZ (Indirect Effects)[c]	
Snakes (Cont.)				
Long-nosed snake (*Rhinocheilus lecontei*)	Typically inhabits deserts, dry prairies, and river valleys. Occurs by day and lays eggs underground or rocks. Burrows rapidly in loose soil. Common in desert regions. About 242,200 acres of potentially suitable habitat occurs in the SEZ region.	566 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	7,130 acres of potentially suitable habitat (2.9% of available potentially suitable habitat)	Small
Mojave rattlesnake (*Crotalus scutulatus*)	Mostly upland desert and lower mountain slopes including barren desert, grasslands, open woodland, and scrubland. Generally avoids broken rocky terrain or densely vegetated areas. Takes refuge in animal burrows or spaces under or among rocks. Widely distributed throughout the Mojave and extreme northern Colorado Deserts. About 2,707,700 acres of potentially suitable habitat occurs in the SEZ region.	14,548 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	103,963 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	Small
Sidewinder (*Crotalus. cerastes*)	Open desert terrain with fine windblown sand, desert flats with sandy washes, or sparsely vegetated sand dunes. Concentrates near washes and areas of relatively dense vegetation where mammal burrows are common. During periods of inactivity, uses underground burrows, occurs under bushes, or almost completely snuggles under sand. Widely distributed and locally abundant in the Mojave and Colorado Deserts. About 2,850,100 acres of potentially suitable habitat occurs in the SEZ region.	14,870 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	109,106 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	Small

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TABLE 9.3.11..1-1 (Cont.)

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[a] Maximum area of potentially suitable habitat affected relative to total available potentially suitable habitat within the SEZ region (i.e., a 50-mi [80-km] radius from the center of the SEZ). Habitat availability was determined from potentially suitable land cover for each species (USGS 2004, 2005, 2007).

[b] Direct effects within the SEZ consist of ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations. A maximum of 19,160 acres would be developed in the SEZ.

[c] The area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary. Indirect effects include effects from surface runoff, dust, noise, lighting, etc., from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance from the SEZ boundary.

[d] Overall impact magnitude categories were based on professional judgment and were (1) *small*: ≤1% of potentially suitable habitat for the species would be lost and the activity would not result in a measurable change in the carrying capacity or population size in the affected area; (2) *moderate*: >1 but ≤10% of potentially suitable habitat for the species would be lost and the activity would potentially result in a measurable but moderate (not destabilizing) change in the carrying capacity or population size in the affected area; and (3) *large*: >10% of potentially suitable habitat for the species would be lost and the activity would result in a potentially large, measurable, and destabilizing change in the carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects, because those effects would be difficult to mitigate. Programmatic design features would reduce most indirect effects to negligible levels.

[e] Species-specific mitigation is presented for those species that have particular habitat features that could be readily avoided. For species or individuals occurring outside the SEZ (in the area of indirect effects), no mitigation measures beyond required programmatic design features have been identified.

[f] To convert acres to km^2, multiply by 0.004047.

Sources: CDFG (2008); NatureServe (2010); USGS (2004, 2005, 2007).

impacts on amphibians and reptiles are anticipated to be small, given the relative abundance of potentially suitable habitats in the SEZ region. However, as potentially suitable habitats for a number of the amphibian and reptile species occur throughout much of the SEZ, additional species-specific mitigation of direct effects for those species would be difficult or infeasible.

9.3.11.2 Birds

9.3.11.2.1 Affected Environment

This section addresses bird species that are known to occur, or for which potentially suitable habitat occurs, on or within the potentially affected area of the proposed Pisgah SEZ. The list of bird species potentially present in the project area was determined from range maps and habitat information available from the CWHRS (CDFG 2008). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005, 2007). See Appendix M for additional information on the approach used.

> **Desert Focal Bird Species**
>
> Bird species whose requirements define spatial attributes, habitat characteristics, and management regimes representative of a healthy desert system (Chase and Geupel 2005).

Almost 100 species of birds have a range that encompasses the proposed Pisgah SEZ region. However, habitats for more than 35 of these species either do not occur on or are limited within the SEZ (e.g., habitat for waterfowl and wading birds). In addition, the SEZ region is only within the winter range (40 species) or summer range (9 species) of a number of the bird species. Ten bird species that could occur on or in the affected area of the SEZ are considered focal species for the California Partners in Flight's *Desert Bird Conservation Plan* (CalPIF 2009): ash-throated flycatcher (*Myiarchus cinerascens*), black-tailed gnatcatcher (*Polioptila melanura*), black-throated sparrow (*Amphispiza bilineata*), burrowing owl (*Athene cunicularia*), common raven (*Corvus corax*), Costa's hummingbird (*Calypte costae*), ladder-backed woodpecker (*Picoides scalaris*), Le Conte's thrasher (*Toxostoma lecontei*), phainopepla (*Phainopepla nitens*), and verdin (*Auriparus flaviceps*). Habitats for these species are described in Table 9.3.11.2-1. The ash-throated flycatcher and black-throated sparrow would be summer residents within the SEZ, while the other desert focal bird species could occur year-round (CalPIF 2009).

Waterfowl, Wading Birds, and Shorebirds

As discussed in Section 4.10.2.2.2, waterfowl (ducks, geese, and swans), wading birds (herons and cranes), and shorebirds (avocets, gulls, plovers, rails, sandpipers, stilts, and terns) are among the most abundant groups of birds in the six-state study area. Nearly 20 waterfowl, wading bird, and shorebird species occur within the SEZ region. Within the SEZ, waterfowl, wading birds, and shorebirds are uncommon because of the lack of perennial aquatic habitat. The killdeer (*Charadrius vociferus*) and least sandpiper (*Calidris minutilla*) (shorebird species)

TABLE 9.3.11.2-1 Representative Bird Species That Could Occur on or in the Affected Area of the Proposed Pisgah SEZ and Potential Impacts

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a]		Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
		Within SEZ (Direct Effects)[b]	Outside SEZ (Indirect Effects)[c]	
Shorebirds				
Killdeer (*Charadrius vociferus*)	Widespread throughout California. Open areas such as fields, meadows, lawns, mudflats, and shores. Nests on ground in open dry or gravelly locations. About 189,600 acres[f] of potentially suitable habitat occurs in the SEZ region. Year-round.	3,234 acres of potentially suitable habitat lost (1.7% of available potentially suitable habitat)	7,079 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Moderate. Avoid development within Troy Lake. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Least sandpiper (*Calidris minutilla*)	Wet meadows, mudflats, flooded fields, lake shores, edge of salt marshes, and river sandbars. About 12,100 acres of potentially suitable habitat occurs in the SEZ region. Common to abundant in winter.	0 acres of potentially suitable habitat lost (0.0% of available potentially suitable habitat)	115 acres of potentially suitable habitat (0.9% of available potentially suitable habitat)	None to small. Avoid development within Troy Lake. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

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TABLE 9.3.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a] Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a] Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Neotropical Migrants				
Ash-throated flycatcher (*Myiarchus cinerascens*)	Common in scrub and woodland habitats including desert riparian and desert washes. Requires hole/cavity for nesting. Uses shrubs or small trees for foraging perches. About 3,010,200 acres of potentially suitable habitat occurs in the SEZ region. Summer.	15,671 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	109,649 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	Small. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Black-tailed gnatcatcher (*Polioptila melanura*)	Nests in bushes mainly in wooded desert washes with dense mesquite, palo verde, ironwood, and acacia. Also occurs in desert scrub habitat. About 2,536,600 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	15,114 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat)	108,153 acres of potentially suitable habitat (4.3% of available potentially suitable habitat)	Small. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Black-throated sparrow (*Amphispiza bilineata*)	Chaparral and desert scrub habitats with sparse to open stands of shrubs. Often in areas with scattered Joshua trees. Nests in thorny shrubs or cactus. About 2,994,700 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	18,072 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat)	126,187 acres of potentially suitable habitat (4.2% of available potentially suitable habitat)	Small. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 9.3.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Neotropical Migrants (Cont.)				
Brewer's sparrow (*Spizella breweri*)	Common in Mojave and Colorado Deserts during winter. Occupies open desert scrub and cropland habitats. About 2,737,100 acres of potentially suitable habitat occurs in the SEZ region.	14,557 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	104,574 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	Small. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Cactus wren (*Campylorhynchus brunneicapillus*)	Desert (especially areas with cholla cactus or yucca), mesquite, arid scrub, coastal sage scrub, and trees in towns in arid regions. Nests in *Opuntia* spp.; twiggy, thorny trees and shrubs; and sometimes in buildings. Nests may be used as winter roost. Locally common in the Mojave and Colorado Deserts. About 1,765,100 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	1,749 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	45,841 acres of potentially suitable habitat (2.6% of available potentially suitable habitat)	Small. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Common poorwill (*Phalaenoptilus nuttallii*)	Scrubby and brushy areas, prairie, desert, rocky canyons, open woodlands, and broken forests. Mostly in arid and semiarid habitats. Nests in open areas on a bare site. About 3,878,000 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	17,176 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	147,883 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	Small. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 9.3.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a] Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a] Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Neotropical Migrants (Cont.)				
Common raven (*Corvus corax*)	Occurs in most habitats. Trees and cliffs provide cover. Roosts primarily in trees. Nests on cliffs, bluffs, tall trees, or human-made structures. Forages in sparse, open terrain. About 3,024,200 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	15,866 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	110,007 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	Small. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Costa's hummingbird (*Calypte costae*)	Desert and semidesert areas, arid brushy foothills, and chaparral. Main habitats are desert washes, edges of desert riparian and valley foothill riparian areas, coastal shrub, desert scrub, desert succulent shrub, lower-elevation chaparral, and palm oasis. Also in mountains, meadows, and gardens during migration and winter. Most common in canyons and washes when nesting. Nests are located in trees, shrubs, vines, or cacti. About 2,984,200 acres of potentially suitable habitat occurs in the SEZ region. Common in summer and uncommon in winter in California.	15,671 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	109,639 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 9.3.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Neotropical Migrants (Cont.)				
Greater roadrunner (*Geococcyx californianus*)	Desert scrub, chaparral, edges of cultivated lands, and arid open areas with scattered brush. Requires thickets, large bushes, or small trees for shade, refuge, and roosting. Usually nests low in trees, shrubs, or clump of cactus. Rarely nests on ground. About 4,623,800 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	19,160 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	162,972 acres of potentially suitable habitat (3.5% of available potentially suitable habitat)	Small. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Horned lark (*Eremophila alpestris*)	Common to abundant resident in a variety of open habitats. Breeds in grasslands, sagebrush, semidesert shrublands, and alpine tundra. During migration and winter, inhabits the same habitats other than tundra, and also occurs in agricultural areas. Usually occurs where plant density is low and there are exposed soils. About 2,882,500 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	15,427 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	107,665 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 9.3.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a] Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a] Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Neotropical Migrants (Cont.)				
House finch (*Carpodacus mexicanus*)	Variety of areas including arid scrub and brush, desert riparian areas, open woodlands, cultivated lands, and savannas. Usually forages in areas with elevated escape perches (e.g., trees, tall shrubs, transmission lines, and buildings). Roosts and nests in sheltered sites in trees; tall, dense shrubs; man-made structures; cliff crevices; or earthen banks. About 93,200 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	439 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	2,334 acres of potentially suitable habitat (2.5% of available potentially suitable habitat)	Small. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Ladder-backed woodpecker (*Picoides scalaris*)	Fairly common in Mojave and Colorado Deserts. Variety of habitats including deserts, arid scrub, riparian woodlands, mesquite, scrub oak, pinyon-juniper woodlands. Digs nest hole in rotted stub or dead or dying branches of various trees. Also nests in saguaro, agave, yucca, fence posts, and utility poles. Nests on ledges; branches of trees, shrubs, and cactus; and holes in trees or walls. About 2,976,300 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	15,671 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	109,639 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Le Conte's thrasher (*Toxostoma lecontei*)	Open desert wash, alkali desert scrub, and desert succulent shrub habitats. Prefers to nest and forage in arroyos and washes lined with dense stands of creosotebush and salt bush. About 2,932,100 acres of potentially suitable habitat occurs in the SEZ region. Year-round, but uncommon to rare.	15,114 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	110,969 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	Small. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 9.3.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Neotropical Migrants (Cont.)				
Lesser nighthawk (*Chordeiles acutipennis*)	Open country, desert regions, scrub, savanna, and cultivated areas. Usually near water including open marshes, salt ponds, large rivers, rice paddies, and beaches. Roosts on low perches or the ground. Nests in the open on bare sites. About 4,546,100 acres of potentially suitable habitat occurs in the SEZ region. Uncommon summer resident.	19,160 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	172,934 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	Small. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Loggerhead shrike (*Lanius ludovicianus*)	Open country with scattered trees and shrubs, savanna, desert scrub, desert riparian, Joshua tree, and occasionally open woodland habitats. Perches on poles, wires, or fence posts (suitable hunting perches are important aspect of habitat). Nests in shrubs and small trees. About 3,073,900 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	16,101 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	111,886 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	Small. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 9.3.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a] Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a] Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Neotropical Migrants (Cont.)				
Phainopepla (*Phainopepla nitens*)	Common in Mojave and Colorado Deserts. Desert scrub, mesquite, juniper and oak woodlands, tall brush, washes, riparian woodlands, and orchards. Nests in dense foliage of large shrubs or trees, sometimes in a clump of mistletoe. About 637,700 acres of potentially suitable habitat occurs in the SEZ region. Year-round, but many move to more western and northern portions of California during summer.	566 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	9,946 acres of potentially suitable habitat (1.6% of available potentially suitable habitat)	Small. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Say's phoebe (*Sayornis saya*)	Arid open country, deserts, sagebrush plains, dry barren foothills, canyons, cliffs, ranches, and rural homes. Nests in cliff crevices, holes in banks, sheltered ledges, tree cavities, under bridges and roofs, and in mines. About 4,245,300 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	17,362 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	150,973 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	Small. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Verdin (*Auriparus flaviceps*)	Common to abundant in Colorado Desert, less common in Mojave Desert. Desert riparian, desert wash, desert scrub, and alkali desert scrub areas with large shrubs and small trees. Nests in shrubs, small trees, or cactus. About 2,790,400 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	14,792 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	105,870 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	Small. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 9.3.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a] Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a] Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Neotropical Migrants (Cont.)				
White-throated swift (*Aeronautes saxatalis*)	Mountainous country near cliffs and canyons where breeding occurs. Forages over forest and open situations. Nests in rock crevices and canyons, sometimes in buildings. Ranges widely over most terrain and habitats, usually high in the air. About 1,373,200 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	1,944 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	43,395 acres of potentially suitable habitat (3.2% of available potentially suitable habitat)	Small. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Birds of Prey				
American kestrel (*Falco sparverius*)	Occurs in most open habitats, in various shrub and early successional forest habitats, forest openings, and various ecotones. Perches on trees, snags, rocks, utility poles and wires, and fence posts. Uses cavities in trees, snags, rock areas, banks, and buildings for nesting and cover. About 2,097,400 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	6,016 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	66,501 acres of potentially suitable habitat (3.2% of available potentially suitable habitat)	Small.

TABLE 9.3.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Birds of Prey (Cont.)				
Golden eagle (*Aquila chrysaetos*)	Grasslands, shrublands, pinyon-juniper woodlands, and ponderosa pine forests. Occasionally in most other habitats, especially during migration and winter. Nests on cliffs and sometimes trees in rugged areas, with breeding birds ranging widely over surrounding areas. About 4,481,900 acres of potentially suitable habitat occurs in the SEZ region. Winter.	19,160 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	171,977 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	Small. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Bald and Golden Eagle Protection Act.
Prairie falcon (*Falco mexicanus*)	Associated primarily with perennial grasslands, savannahs, rangeland, some agricultural fields, and desert scrub areas. Nests in pothole or well-sheltered ledge on rocky cliff or steep earth embankment. May also nest in man-made excavations on otherwise unsuitable cliffs and old nests of ravens, hawks, and eagles. Forages in large patch areas with low vegetation. May forage over irrigated croplands in winter. About 3,681,900 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	16,297 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	144,104 acres of potentially suitable habitat (3.9% of available potentially suitable habitat)	Small.

TABLE 9.3.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Birds of Prey (Cont.)				
Red-tailed hawk (*Buteo jamaicensis*)	Wide variety of habitats from deserts, mountains, and populated valleys. Open areas with scattered, elevated perch sites such as scrub desert, plains and montane grassland, agricultural fields, pastures urban parklands, broken coniferous forests, and deciduous woodland. Nests on cliff ledges or in tall trees. About 662,800 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	1,309 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	8,831 acres of potentially suitable habitat (1.3% of available potentially suitable habitat)	Small.
Turkey vulture (*Cathartes aura*)	Occurs in open stages of most habitats that provide adequate cliffs or large trees for nesting, roosting, and resting. Migrates and forages over most open habitats. Will roost communally in trees, exposed boulders, and occasionally transmission line support towers. About 4,189,700 acres of potentially suitable habitat occurs in the SEZ region. Summer.	16,932 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	148,794 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	Small.
Upland Game Birds				
Gambel's quail (*Callipepla gambelii*)	Deserts, especially in areas with brushy or thorny growth, and adjacent cultivated areas. Usually occurs near water. Nests on the ground under cover of small trees, shrubs, and grass tufts. About 4,263,600 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	17,176 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	150,711 acres of potentially suitable habitat (3.5% of available potentially suitable habitat)	Small.

TABLE 9.3.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Upland Game Birds (Cont.)				
Mourning dove (*Zenaida macroura*)	Habitat generalist, occurring in grasslands, shrublands, croplands, lowland and foothill riparian forests, ponderosa pine forests, deserts, and urban and suburban areas. Rarely in aspen and other forests, coniferous woodlands, and alpine tundra. Nests on ground or in trees. Winters mostly in lowland riparian forests adjacent to cropland. About 3,207,400 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	18,911 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat)	116,840 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	Small. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

a Maximum area of potentially suitable habitat affected relative to total available potentially suitable habitat within the SEZ region (i.e., a 50-mi [80-km] radius from the center of the SEZ). Habitat availability was determined from potentially suitable land cover for each species (USGS 2004, 2005, 2007).

b Direct effects within the SEZ consist of ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations. A maximum of 19,160 acres would be developed in the SEZ.

c The area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary. Indirect effects include effects from surface runoff, dust, noise, lighting, etc., from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance away from the SEZ boundary.

d Overall impact magnitude categories were based on professional judgment and were (1) *small*: ≤1% of potentially suitable habitat for the species would be lost and the activity would not result in a measurable change in the carrying capacity or population size in the affected area; (2) *moderate*: >1 but ≤10% of potentially suitable habitat for the species would be lost and the activity would potentially result in a measurable but moderate (not destabilizing) change in the carrying capacity or population size in the affected area; and (3) *large*: >10% of potentially suitable habitat for the species would be lost and the activity would result in a potentially large, measurable, and destabilizing change in the carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects, because those effects would be difficult to mitigate. Programmatic design features would reduce most indirect effects to negligible levels.

Footnotes continued on next page.

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TABLE 9.3.11.2-1 (Cont.)

[e] Species-specific mitigation is presented for those species that have particular habitat features that could be readily avoided. For species or individuals occurring outside the SEZ (in the area of indirect effects), no mitigation measures beyond required programmatic design features have been identified.

[f] To convert acres to km^2, multiply by 0.004047

Sources: CDFG (2008); NatureServe (2010); USGS (2004, 2005, 2007).

would be expected to occur on the SEZ in the area of Troy Lake. The Colorado River, located more than 95 mi (153 km) east of the SEZ, and the Salton Sea, located more than 85 mi (137 km) south of the SEZ, would provide more productive habitat for this group of birds.

Neotropical Migrants

As discussed in Section 4.10.2.2.3, neotropical migrants represent the most diverse category of birds within the six-state study area. Neotropical migrants expected to occur on or in the affected area of the proposed Pisgah SEZ throughout the year include the black-tailed gnatcatcher, black-throated sparrow, cactus wren (*Campylorhynchus brunneicapillus*), common poorwill (*Phalaenoptilus nuttallii*), common raven, Costa's hummingbird, greater roadrunner (*Geococcyx californianus*), horned lark (*Eremophila alpestris*), house finch (*Carpodacus mexicanus*), ladder-backed woodpecker, Le Conte's thrasher, loggerhead shrike (*Lanius ludovicianus*), phainopepla, Say's phoebe (*Sayornis saya*), verdin, and white-throated swift (*Aeronautes saxatalis*). The winter range for the Brewer's sparrow (*Spizella breweri*), green-tailed towhee (*Pipilo chlorurus*), and sage sparrow (*Amphispiza belli*) encompasses the SEZ, while the summer range for the ash-throated flycatcher (*Myiarchus cinerascens*) and lesser nighthawk (*Chordeiles acutipennis*) encompasses the SEZ (CDFG 2008).

Birds of Prey

Section 4.10.2.2.4 provides an overview of the birds of prey (raptors, owls, and vultures) within the six-state study area. Sixteen birds of prey species have ranges that encompass the proposed Pisgah SEZ (CDFG 2008). Raptor species expected to occur within the SEZ include the American kestrel (*Falco sparverius*, year-round), burrowing owl (year-round), ferruginous hawk (*Buteo regalis*, winter), golden eagle (*Aquila chrysaetos*, winter), prairie falcon (*Falco mexicanus*, year-round), red-tailed hawk (*Buteo jamaicensis*, year-round), and turkey vulture (*Cathartes aura*, summer) (CDFG 2008). However, the American kestrel, golden eagle, prairie falcon, and red-tailed hawk make infrequent use of the desert regions within which the proposed Pisgah SEZ occurs. The golden eagle is a Fully Protected species in the State of California (CDFG 2010a).

Upland Game Birds

Section 4.10.2.2.5 provides an overview of the upland game birds (primarily pheasants, grouse, quail, and doves) that occur within the six-state study area. Upland game species that could occur year-round within the Pisgah SEZ are Gambel's quail (*Callipepla gambelii*) and mourning dove (*Zenaida macroura*) (CDFG 2008). Gambel's quail is common within the Colorado and Mojave Desert areas of California. It prefers riparian areas and also occurs near streams, springs, and water holes. While it feeds in open habitats, trees or tall shrubs are required for escape cover. It also requires a nearby source of water, particularly during hot summer months (CDFG 2008). Up to 400,000 Gambel's quail are harvested annually in California (CDFG 2008). The mourning dove is common throughout California and can be found in a wide variety of habitats. Regardless of habitat occupied, it requires a nearby water source (CDFG 2008).

Table 9.3.11.2-1 provides habitat information for the representative bird species that could occur on or in the affected area of the proposed Pisgah SEZ. Because of their special status standing, the burrowing owl, ferruginous hawk, and short-eared owl are discussed in Section 9.3.12.1.

9.3.11.2.2 Impacts

The types of impacts that birds could incur from construction, operation, and decommissioning of utility-scale solar energy facilities are discussed in Section 5.10.2.1. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through any additional mitigation applied. Section 9.3.11.2.3, below, identifies design features of particular relevance to the proposed Pisgah SEZ.

The assessment of impacts on bird species is based on available information on the presence of species in the affected area as presented in Section 9.3.11.2.1 following the analysis approach described in Appendix M. Additional NEPA assessments and coordination with state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid or mitigate impacts on birds (see Section 9.3.11.2.3).

In general, impacts on birds would result from habitat disturbance (i.e., habitat reduction, fragmentation, and alteration) and from disturbance, injury, or mortality to individual birds. Table 9.3.11.2-1 summarizes the potential impacts on representative bird species resulting from solar energy development that could occur on or in the affected area in the proposed Pisgah SEZ. Direct impacts on bird species would be small for most bird species; only 0.6% or less of habitats potentially suitable for most representative bird species would be lost, although a moderate impact is indicated for the killdeer, because 1.7% of its potentially suitable habitat would be lost (Table 9.3.11.2-1). Larger areas of suitable habitat for bird species that occur within the area of potential indirect effects (e.g., up to 4.3% of potentially suitable habitat for the black-tailed gnatcatcher). Other impacts on birds could result from collision with vehicles and facility structures, surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, noise, lighting, spread of invasive species, accidental spills, and harassment. Indirect impacts on areas outside the SEZ (e.g., impacts caused by dust generation, erosion, and sedimentation) are expected to be negligible with implementation of programmatic design features.

Decommissioning of facilities and reclamation of disturbed areas after operations cease could result in short-term negative impacts on individuals and habitats adjacent to project areas, but long-term benefits would accrue if suitable habitats were restored in previously disturbed areas. Section 5.10.2.1.4 provides an overview of the impacts of decommissioning and reclamation on wildlife. Of particular importance for bird species would be the restoration of original ground surface contours, soils, and native plant communities associated with semiarid shrublands.

9.3.11.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

The successful implementation of programmatic design features presented in Appendix A, Section A.2.2, would reduce the potential for effects on birds. Indirect impacts could be reduced to negligible levels by implementing programmatic design features, especially those engineering controls that would reduce runoff, sedimentation, spills, and fugitive dust. While some SEZ-specific design features important to reducing impacts on birds are best established when project details are considered, some design features can be identified at this time, as follows:

- Pre-disturbance surveys should be conducted within the SEZ for bird species listed under the Migratory Bird Treaty Act. Impacts on potential nesting habitat of these species should be avoided, particularly during the nesting season.

- Pre-disturbance surveys should be conducted within the SEZ for the following desert bird focal species (CalPIF 2009): ash-throated flycatcher, black-tailed gnatcatcher, black-throated sparrow, burrowing owl, common raven, Costa's hummingbird, ladder-backed woodpecker, Le Conte's thrasher, phainopepla, and verdin. Impacts on potential nesting habitat of these species should be avoided.

- Plant species that positively influence the presence and abundance of the desert bird focal species should be avoided to the extent practicable. These species include Goodding's willow, yucca, Joshua tree, mesquite, honey mesquite, screwbean, desert mistletoe, big saltbush, smoketree, and catclaw acacia (CalPIF 2009)

- Take of golden eagles and other raptors should be avoided. Mitigation regarding the golden eagle should be developed in consultation with the USFWS and CDFG. A permit may be required under the Bald and Golden Eagle Protection Act.

- Development within the area of the ephemeral drainages and Troy Lake should be avoided.

If these SEZ-specific design features are implemented in addition to programmatic design features, impacts on bird species could be reduced. Any residual impacts on birds are anticipated to be small due to the relative abundance of suitable habitats in the SEZ region. However, as potentially suitable habitats for a number of the bird species occur throughout much of the SEZ, species-specific mitigation of direct effects for those species would be difficult or infeasible.

9.3.11.3 Mammals

9.3.11.3.1 Affected Environment

This section addresses mammal species that are known to occur, or for which suitable habitat occurs, on or within the potentially affected area of the Pisgah SEZ. The list of mammal species potentially present in the project area was determined from range maps and habitat information available from the CWHRS (CDFG 2008). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005, 2007). See Appendix M for additional information on the approach used. On the basis of species distributions and habitat preferences, about 35 mammal species could occur within the SEZ (CDFG 2008). The following discussion emphasizes big game and other mammal species that (1) have key habitats within or near the Pisgah SEZ, (2) are important to humans (e.g., big game, small game, and furbearer species), and/or (3) are representative of other species that share similar habitats.

Big Game

The desert bighorn sheep (*Ovis canadensis nelsoni*) and mule deer (*Odocoileus hemionus*) are the only big game species expected to occur in the area of the proposed Pisgah SEZ. Because it is a BLM sensitive species, the desert bighorn sheep is discussed in Section 9.3.12. The mule deer is common to abundant throughout California, except in deserts and intensely farmed areas (CDFG 2008). It prefers a mosaic of vegetation that has herbaceous openings, dense brush or tree thickets, riparian areas, and abundant edges. Mule deer are browsers and grazers, feeding on shrubs, forbs, and a few grasses. Brush is important for escape cover and for thermal regulation in winter and summer (CDFG 2008). Mule deer in San Bernardino County are found throughout the mountainous areas at elevations of 4,000 to 8,000 ft (1,219 to 2,438 m) (CDFG 2010b). Therefore, mule deer would not be expected with any regularity within the valley between Cady Mountains and the Rodman and Lava Bed Mountains where the proposed Pisgah SEZ would be located. The highest elevation of the SEZ is about 2,300 ft (701 m) (see Section 9.3.1.1).

Other Mammals

A number of small game and furbearer species occur within the area of the proposed Pisgah SEZ. These include the American badger (*Taxidea taxus*), black-tailed jackrabbit (*Lepus californicus*), bobcat (*Lynx rufus*), coyote (*Canis latrans*), desert cottontail (*Sylvilagus audubonii*), round-tailed ground squirrel (*Spermophilus tereticaudus*), and white-tailed antelope squirrel (*Ammospermophilus leucurus*) (CDFG 2008).

Nongame (small) mammal species such as bats, mice, kangaroo rats, and shrews also occur within the area of the proposed Pisgah SEZ. These include the cactus mouse (*Peromyscus eremicus*), canyon deermouse (*P. crinitus*), desert kangaroo rat (*Dipodomys deserti*), desert shrew (*Notiosorex crawfordi*), desert woodrat (*Neotoma lepida*), little pocket mouse

(*Perognathus longimembris*), long-tailed pocket mouse (*Chaetodipus formosus*), Merriam's kangaroo rat (*Dipodomys merriami*), and southern grasshopper mouse (*Onychomys torridus*) (CDFG 2008). The range of nine bat species encompasses the SEZ: big brown bat (*Eptesicus fuscus*), Brazilian free-tailed bat (*Tadarida brasiliensis*), Californian leaf-nosed bat (*Macrotus californicus*), California mastiff bat (*Eumops perotis californicus*), California myotis (*Myotis californicus*), pallid bat (*Antrozous pallidus*), spotted bat (*Euderma maculatum*), Townsend's big-eared bat (*Corynorhinus townsendii*), and western pipistrelle (*Parastrellus hesperus*). Most bat species would utilize the SEZ only during foraging. Roost sites for the species (e.g., caves, hollow trees, rock crevices, or buildings) are absent to scarce on or in the affected area of the SEZ.

Table 9.3.11.3-1 provides habitat information for the representative mammal species that could occur on or in the affected area of the proposed Pisgah SEZ. Because of their special status standing, the California mastiff bat, Californian leaf-nose bat, pallid bat, and Townsend's big-eared bat are discussed in Section 9.3.12.1.

9.3.11.3.2 Impacts

The types of impacts that mammals could incur from construction, operation, and decommissioning of utility-scale solar energy facilities are discussed in Section 5.10.2.1. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through any additional mitigation applied. Section 9.3.11.3.3, below, identifies design features of particular relevance to the proposed Pisgah SEZ.

The assessment of impacts on mammal species is based on available information on the presence of species in the affected area as presented in Section 9.3.11.3.1 following the analysis approach described in Appendix M. Additional NEPA assessments and coordination with state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid or mitigate impacts on mammals (see Section 9.3.11.3.3).

Table 9.3.11.3-1 summarizes the potential impacts on representative mammal species resulting from solar energy development (with the implementation of required programmatic design features) in the proposed Pisgah SEZ.

Direct impacts on small game, furbearers, and nongame (small) mammal species would be small, because 0.6% or less of potentially suitable habitats for representative mammal species would be lost (Table 9.3.11.3-1). Larger areas of suitable habitat for these species occur within the area of potential indirect effects (e.g., up to 4.2% for the desert cottontail). Other impacts on mammals could result from collision with fences and vehicles, surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, noise, lighting, spread of invasive species, accidental spills, and harassment. These indirect impacts are expected to be negligible with implementation of programmatic design features.

TABLE 9.3.11.3-1 Representative Mammal Species That Could Occur on or in the Affected Area of the Proposed Pisgah SEZ and Potential Impacts

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a] Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a] Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Small Game and Furbearers				
American badger (*Taxidea taxus*)	Open grasslands and deserts, meadows in subalpine and montane forests, alpine tundra. Digs burrows in friable soils. Most common in areas with abundant populations of ground squirrels, prairie dogs, and pocket gophers. Relatively uncommon throughout California. About 2,729,900 acres[f] of potentially suitable habitat occurs in the SEZ region.	14,548 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	103,973 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	Small.
Black-tailed jackrabbit (*Lepus californicus*)	Open plains, fields, and deserts with scattered thickets or patches of shrubs. Also open, early stages of forests and chaparral habitats. Rests during the day in shallow depressions, and uses shrubs for cover. About 4,316,500 acres of potentially suitable habitat occurs in the SEZ region.	17,049 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	154,334 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	Small.
Bobcat (*Lynx rufus*)	Occurs in nearly all habitats and successional stages. Optimal habitats include mixed woodlands and forest edges, hardwood forests, swamps, forested river bottoms, brushlands, deserts, mountains, and other areas with thick undergrowth. Availability of water may limit its distribution in xeric regions. Uses rocky clefts, caves, hollow logs, spaces under fallen trees, and so forth when inactive; usually changes shelter areas daily. About 2,912,600 acres of potentially suitable habitat occurs in the SEZ region.	15,228 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	108,276 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small.

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TABLE 9.3.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a]		Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
		Within SEZ (Direct Effects)[b]	Outside SEZ (Indirect Effects)[c]	
Small Game and Furbearers (Cont.)				
Coyote (*Canis latrans*)	Suitable habitat characterized by interspersions of brush and open areas with free water. Least common in dense coniferous forest. Where human control efforts occur, it is restricted to broken, rough country with abundant shrub cover and a good supply of rabbits or rodents. About 4,766,300 acres of potentially suitable habitat occurs in the SEZ region.	19,160 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	179,967 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	Small. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Desert cottontail (*Sylvilagus audubonii*)	Abundant to common in grasslands, open forests, and desert shrub habitats. Can occur in areas with minimal vegetation as long as adequate cover (e.g., rock piles, fallen logs, fence rows) is present. Thickets and patches of shrubs, vines, and brush also used as cover. About 2,486,400 acres of potentially suitable habitat occurs in the SEZ region.	15,222 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat)	105,245 acres of potentially suitable habitat (4.2% of available potentially suitable habitat)	Small.
Round-tailed ground squirrel (*Spermophilus tereticaudus*)	Optimum habitat includes desert succulent shrub, desert wash, desert scrub, alkali desert scrub, and levees in cropland habitat. Also occurs in urban habitats. Burrows usually at base of shrubs. About 2,893,600 acres of potentially suitable habitat occurs in the SEZ region.	15,427 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	107,732 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small.

TABLE 9.3.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a] Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a] Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Small Game and Furbearers (Cont.)				
White-tailed antelope squirrel (*Ammospermophilus leucurus*)	Common to abundant in California deserts. Optimal habitats are desert scrub, sagebrush, alkali desert scrub, Joshua tree, bitterbrush, and pinyon-juniper. Fairly common in desert riparian, desert succulent shrub, and desert wash habitats. Also occurs in mixed chaparral and annual grassland habitats. Requires friable soil for burrowing. Burrows may be under shrubs or in open; often uses abandoned kangaroo rat burrows. About 4,060,100 acres of potentially suitable habitat occurs in the SEZ region.	16,297 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	146,865 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	Small.
Nongame (small) Mammals				
Big brown bat (*Eptesicus fuscus*)	Deserts, forests and woodlands, old fields, shrublands, and urban/suburban areas. Uncommon in hot desert habitats. Summer roosts are in buildings, hollow trees, rock crevices, tunnels, and cliff swallow nests. Maternity colonies occur in attics, barns tree cavities, rock crevices, and caves. Caves, mines, and man-made structures used for hibernation sites. About 3,679,000 acres of potentially suitable habitat occurs in the SEZ region.	16,492 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	144,454 acres of potentially suitable habitat (3.9% of available potentially suitable habitat)	Small.

TABLE 9.3.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a] Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a] Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Nongame (small) Mammals (Cont.)				
Brazilian free-tailed bat (*Tadarida brasiliensis*)	Cliffs, deserts, grasslands, old fields, savannas, shrublands, woodlands, and suburban/urban areas. Roosts in buildings, caves, and hollow trees. May roost in rock crevices, bridges, signs, or cliff swallow nests during migration. Large maternity colonies inhabit caves, buildings, culverts, and bridges. About 3,921,000 acres of potentially suitable habitat occurs in the SEZ region.	17,058 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	151,534 acres of potentially suitable habitat (3.9% of available potentially suitable habitat)	Small.
Cactus mouse (*Peromyscus eremicus*)	Deserts, shrublands, chaparral, and coniferous woodlands. Occurs on rocky areas and areas with sandy substrates and loamy soils. Nests in rock heaps, stone walls, burrows, brush fences, and woodrat houses. About 2,992,500 acres of potentially suitable habitat occurs in the SEZ region.	15,671 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	109,640 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small.
Californian myotis (*Myotis californicus*)	Cliffs, deserts, forests, woodlands, grasslands, savannas, and shrublands. Often uses man-made structures for night roosts. Uses crevices for summer day roosts. May roost on small desert shrubs or on the ground. Hibernates in caves, mines, tunnels, or buildings. Maternity colonies occur in rock crevices, under bark, or under eaves of buildings. Common to abundant below 6,000 ft. About 3,682,100 acres of potentially suitable habitat occurs in the SEZ region.	16,297 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	144,126 acres of potentially suitable habitat (3.9% of available potentially suitable habitat)	Small.

TABLE 9.3.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a] Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a] Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Nongame (small) Mammals (Cont.)				
Canyon deermouse (*Peromyscus crinitus*)	Found in most desert and chaparral habitats. Gravelly desert pavement, talus, boulders, cliffs, and slickrock—rocky areas with virtually any type of plant cover. About 2,995,000 acres of potentially suitable habitat occurs in the SEZ region.	18,620 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat)	124,240 acres of potentially suitable habitat (4.1% of available potentially suitable habitat)	Small.
Desert kangaroo rat (*Dipodomys deserti*)	Low deserts, deep wind-drifted sandy soil with sparse vegetation, alkali sinks, and shadscale or creosotebush scrub. Nests in burrows dug in mounds, usually under vegetation. About 230,600 acres of potentially suitable habitat occurs in the SEZ region.	566 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	7,062 acres of potentially suitable habitat (3.1% of available potentially suitable habitat)	Small.
Desert shrew (*Notiosorex crawfordi*)	Generally found in arid areas with adequate cover for nesting and resting. Deserts, semiarid grasslands with scattered cactus and yucca, chaparral slopes, alluvial fans, sagebrush, gullies, juniper woodlands, riparian areas, and dumps. About 4,405,300 acres of potentially suitable habitat occurs in the SEZ region.	17,498 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	155,857 acres of potentially suitable habitat (3.5% of available potentially suitable habitat)	Small.
Desert woodrat (*Neotoma lepida*)	Sagebrush scrub; chaparral; deserts and rocky slopes with scattered cactus, yucca, pine-juniper, or other low vegetation; creosotebush desert; Joshua tree woodlands; scrub oak woodlands, pinyon-juniper woodlands; and riparian zones. Most abundant in rocky areas with Joshua trees. Dens built of debris on ground, among cacti or yucca, along cliffs, among rocks, or occasionally in trees. About 4,408,800 acres of potentially suitable habitat occurs in the SEZ region.	19,160 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	167,836 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	Small. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 9.3.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a] Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a] Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Nongame (small) Mammals (Cont.)				
Little pocket mouse (*Perognathus longimembris*)	Common to abundant in southern California deserts. Preferred habitat includes desert riparian, desert scrub, desert wash, and sagebrush. Nests in an underground burrow. Sandy soil preferred for burrowing, but also commonly burrows on gravel washes and on stony soils. About 3,118,600 acres of potentially suitable habitat occurs in the SEZ region.	15,993 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	114,735 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small.
Long-tailed pocket mouse (*Chaetodipus formosus*)	Common in sagebrush, desert scrub, and desert succulent shrub habitats with rocky or stony groundcover. Often inhabits rocky washes and canyon mouths. Uses underground burrows. About 4,352,300 acres of potentially suitable habitat occurs in the SEZ region.	19,160 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	167,153 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	Small. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Merriam's kangaroo rat (*Dipodomys merriami*)	Most widespread kangaroo rat in California. In southern California, occurs in desert scrub and alkali desert scrub, sagebrush, Joshua tree, and pinyon-juniper habitats. Uses desert flats or slopes with sparse to moderate canopy coverage and sandy to gravelly substrates. Uses underground burrows often located at the base of a shrub. About 3,144,400 acres of potentially suitable habitat occurs in the SEZ region.	15,996 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	115,203 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small.

TABLE 9.3.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Nongame (small) Mammals (Cont.)				
Southern grasshopper mouse (*Onychomys torridus*)	Hot, arid valleys and scrub deserts with sparse and scattered vegetation such as mesquite, creosotebush cholla, yucca, and short grasses. Frequents scrub habitats with friable soils for digging. Also uses abandoned underground burrows. About 3,118,700 acres of potentially suitable habitat occurs in the SEZ region.	15,993 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	114,782 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small.
Spotted bat (*Euderma maculatum*)	Mostly found in the foothills, mountains, and desert regions of southern California. Roosts in caves and cracks or crevices in cliffs and canyons. About 4,100,900 acres of potentially suitable habitat occurs in the SEZ region.	16,297 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	146,942 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	Small.
Western pipistrelle (*Parastrellus hesperus*)	Deserts and lowlands, desert mountain ranges, desert scrub flats, and rocky canyons. Roosts mostly in rock crevices, sometimes mines and caves, and rarely in buildings. Suitable roosts occur in rocky canyons and cliffs. Most abundant bat in desert regions. About 3,668,800 acres of potentially suitable habitat occurs in the SEZ region.	16,492 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	144,416 acres of potentially suitable habitat (3.9% of available potentially suitable habitat)	Small.

[a] Maximum area of potentially suitable habitat affected relative to total available potentially suitable habitat within the SEZ region (i.e., a 50-mi [80-km] radius from the center of the SEZ). Habitat availability was determined from potentially suitable land cover for each species (USGS 2004, 2005, 2007).

[b] Direct effects within the SEZ consist of ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations. A maximum of 19,160 acres would be developed in the SEZ.

Footnotes continued on next page.

TABLE 9.3.11.3-1 (Cont.)

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[c] The area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary. Indirect effects include effects from surface runoff, dust, noise, lighting, etc., from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance from the SEZ boundary.

[d] Overall impact magnitude categories were based on professional judgment and were (1) *small*: ≤1% of potentially suitable habitat for the species would be lost and the activity would not result in a measurable change in the carrying capacity or population size in the affected area; (2) *moderate*: >1 but ≤10% of potentially suitable habitat for the species would be lost and the activity would potentially result in a measurable but moderate (not destabilizing) change in the carrying capacity or population size in the affected area; and (3) *large*: >10% of potentially suitable habitat for the species would be lost and the activity would result in a potentially large, measurable, and destabilizing change in the carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects, because those effects would be difficult to mitigate. Programmatic design features would reduce most indirect effects to negligible levels.

[e] Species-specific mitigation is presented for those species that have particular habitat features that could be readily avoided. For species or individuals occurring outside the SEZ (in the area of indirect effects), no mitigation measures beyond required programmatic design features have been identified.

[f] To convert acres to km^2, multiply by 0.004047.

Sources: CDFG (2008); NatureServe (2010); USGS (2004, 2005, 2007).

Decommissioning of facilities and reclamation of disturbed areas after operations cease could result in short-term negative impacts on individuals and habitats adjacent to project areas, but long-term benefits would accrue if suitable habitats were restored in previously disturbed areas. Section 5.10.2.1.4 provides an overview of the impacts of decommissioning and reclamation on wildlife. Of particular importance for mammal species would be the restoration of original ground surface contours, soils, and native plant communities associated with semiarid shrublands.

9.3.11.3.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A, Section A.2.2, would reduce the potential for effects on mammals. While some SEZ-specific design features are best established when considering specific project details, the following design feature can be identified at this time:

- Development within the ephemeral drainages should be avoided in order to reduce impacts on species such as the round-tailed ground squirrel, white-tailed antelope squirrel, little pocket mouse, long-tailed pocket mouse, and any other mammal species that inhabit wash habitats.

If this SEZ-specific design feature is implemented in addition to programmatic design features, impacts on mammal species could be reduced. Any residual impacts on mammals are anticipated to be small given the relative abundance of suitable habitats in the SEZ region. However, as potentially suitable habitats for a number of the mammal species occur throughout much of the SEZ, additional species-specific mitigation of direct effects for those species would be difficult or infeasible.

9.3.11.4 Aquatic Biota

9.3.11.4.1 Affected Environment

This section addresses aquatic habitats and biota that are known to occur on the proposed Pisgah SEZ itself or within an area that could be affected, either directly or indirectly, by activities associated with solar energy development within the SEZ. For the proposed Pisgah SEZ, the area of direct effect was considered to be the entire SEZ area. As discussed in Section 9.3.1.1, a new access road would not be needed because I-40 runs east–west along the southern edge and then through the Pisgah SEZ. In addition, for this analysis, the impacts of construction and operation of transmission lines outside of the SEZ were not assessed, assuming that the existing 230-kV transmission line might be used to connect some new solar facilities to load centers, and that additional project-specific analysis would be done for new transmission construction or line upgrades.

Within the Pisgah SEZ, Troy Lake is the only body of water (Figure 9.3.10-2). Troy Lake is a dry lake consisting of playa and dune sediments, of which approximately 1,633 acres (6.6 km^2) are within the boundaries of the proposed SEZ. As a dry lake with sediments that contain alkali salts, Troy Lake contains no water, and is not expected to support aquatic biota or aquatic habitats. However, more site-specific data is needed to fully evaluate aquatic biota, if present, in Troy Lake. No other water body, stream, or wetland features are present in the Pisgah SEZ.

The area of potential indirect impacts on aquatic biota from SEZ development was assumed to extend up to 5 mi (8 km) beyond the SEZ boundary. Approximately 1,953 acres (8 km^2) of Troy Lake and 1,249 acres (5 km^2) of Lavic Lake are located within the area of indirect impacts (Figure 9.3.10-2). Like Troy Lake, Lavic Lake is dry and is not expected to support aquatic habitat or communities. However, more site-specific data is needed to fully evaluate aquatic biota, if present, in these dry lake features. No other water body, stream or wetland features are present within the area of indirect effects. Therefore, no aquatic biota or habitats are expected to be present within 5 mi (8 km) of the SEZ.

Outside of the indirect effects area, but within 50 mi (80 km) of the SEZ, there are approximately 2,102 acres (8.5 km^2) of lake (Big Bear Lake) and 16 dry lakes, totaling 86,413 acres (350 km^2). Also present within 50 mi (80 km) of the SEZ are 106 mi (171 km) of intermittent streams. No wetlands are present.

9.3.11.4.2 Impacts

Impacts that could affect aquatic habitats and biota as a result of the development of utility-scale solar energy facilities are discussed in Section 5.10.3.1. Effects particularly relevant to aquatic habitats and communities include water withdrawal and changes in water, sediment, and contaminant inputs associated with runoff. However, no permanent water bodies, perennial streams, or wetlands are present within the boundaries of the Pisgah SEZ or within the 5-mi

(8-km) radius potentially susceptible to indirect impacts. Consequently, no direct or indirect impacts on aquatic habitats are expected to result from construction and operation of utility-scale solar energy facilities at the Pisgah SEZ. However, more detailed site surveys of ephemeral and intermittent surface waters would be needed to determine whether solar energy development activities would result in direct or indirect impacts on aquatic biota.

In arid environments, reduction in the quantity of water in aquatic habitats is of particular concern. While no direct impacts on aquatic communities are anticipated from water withdrawal at the SEZ, the amount of water in surrounding aquatic habitats could be affected if significant amounts of surface water or groundwater are utilized for power-plant cooling water, for washing mirrors, or for other needs. The greatest need for water would occur if technologies that employed wet cooling, such as parabolic troughs or power towers, were developed at the site; the associated impacts would ultimately depend on the water source used (including groundwater from aquifers at various depths). As noted in Section 9.3.9.1.3, it seems unlikely that approval to withdraw water from the Lower Mojave River Valley basin (already fully allocated) and potentially the Lavic Valley basin could be obtained. Obtaining cooling water from other perennial surface water features in the region could affect water levels and, as a consequence, aquatic organisms in those water bodies. Additional details regarding the volume of water required and the types of organisms present in potentially affected water bodies would be required in order to further evaluate the potential for impacts from water withdrawals.

9.3.11.4.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features are identified because effects on aquatic habitats or biota from solar energy development within the proposed Pisgah SEZ would be negligible.

9.3.12 Special Status Species (Threatened, Endangered, Sensitive, and Rare Species)

This section addresses special status species that are known to occur, or for which suitable habitat occurs, on or within the potentially affected area of the proposed Pisgah SEZ. Special status species include the following types of species[6]:

- Species listed as threatened or endangered under the ESA;
- Species that are proposed for listing, under review, or are candidates for listing under the ESA;
- Species that are listed as threatened or endangered by the State of California under the CESA, or that are identified as fully protected by the state7;
- Species that are listed by the BLM as sensitive; and
- Species that have been ranked by the State of California as S1 or S2, or species of concern by the State of California or the USFWS; hereafter referred to as "rare" species.

Special status species known to occur within 50 mi (80 km) of the Pisgah SEZ center (i.e., the SEZ region) were determined from natural heritage records available through NatureServe Explorer (NatureServe 2010), information provided by the California Department of Fish and Game (CDFG 2010a), CNDDB (CDFG 2010b), and CAReGAP (Davis et al. 1998; USGS 2010a). Information reviewed consisted of county-level occurrences as determined from NatureServe, point and polygon element occurrences as determined from CNDDB, and modeled land cover types and predicted suitable habitats for the species within the 50-mi (80-km) region as determined from CAReGAP. The 50-mi (80-km) SEZ region (including the areas of direct and indirect effects) lies entirely within San Bernardino County, California. See Appendix M for additional information on the approach used to identify species that could be affected by development within the SEZ.

9.3.12.1 Affected Environment

The affected area considered in the assessment included the areas of direct and indirect effects. The area of direct effects was defined as the area that would be physically modified during project development (i.e., where ground-disturbing activities would occur). For the Pisgah SEZ, the area of direct effect was limited to the SEZ itself. Due to the proximity of existing infrastructure, the impacts of construction and operation of transmission lines outside of the SEZ

[6] See Section 4.6.4 for definitions of these species categories. Note that some of the categories of species included here do not fit BLM's definition of special status species as defined in BLM Manual 6840 (BLM 2008). These species are included here to ensure broad consideration of species that may be most vulnerable to impacts.

[7] State-listed species are those listed as threatened or endangered under the CESA; California fully protected species are species that receive the strictest take provisions as identified by the CDFG.

are not assessed, assuming that the existing transmission infrastructure might be used to connect some new solar facilities to load centers, and that additional project-specific analysis would be conducted for new transmission construction or line upgrades. Similarly, the impacts of construction or upgrades to access roads were not assessed for this SEZ due to the proximity of I-40 (see Section 9.3.1.2 for a discussion of development assumptions for this SEZ). The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary where ground-disturbing activities would not occur but that could be indirectly affected by activities in the area of direct effect. Indirect effects considered in the assessment include effects from surface runoff, dust, noise, lighting, and accidental spills from the SEZ, but do not include ground-disturbing activities. The potential magnitude of indirect effects would decrease with increasing distance away from the SEZ. This area of indirect effect was identified on the basis of professional judgment and was considered sufficiently large to bound the area that would potentially be subject to indirect effects. The affected area includes both the direct and indirect effects areas.

The primary habitat type in the affected area is Sonora–Mojave creosotebush–white bursage desert scrub (see Section 9.3.10). Potentially unique habitats in the affected area in which special status species may reside include desert dunes, rocky cliffs and outcrops, desert washes, and playas. Dry lake desert playas in the affected area include Troy Lake and Lavic Lake. The Troy Lake playa occurs in the western portion of the SEZ; Lavic Lake occurs outside of the SEZ but within the area of indirect effects approximately 4 mi (6 km) southeast of the SEZ. The Mojave River occurs outside of the affected area but flows as near as 7 mi (11 km) northwest of the SEZ (Figure 9.3.12.1-1).

In scoping comments on the proposed Pisgah SEZ (Stout 2009), the USFWS expressed concern that groundwater withdrawals associated with solar energy development on the SEZ may reduce the groundwater supply from the regional basin that supports aquatic and riparian habitat in the SEZ region, particularly artificial refugia for the federally listed endangered Mohave tui chub at Camp Cady, which is approximately 6 mi (10 km) northwest of the SEZ. Groundwater withdrawals within the SEZ may also affect aquatic and riparian habitats along the Mojave River, approximately 6 mi (10 km) northwest of the SEZ. Although these areas are outside the above-defined affected area, they are considered in the area of indirect effects for this evaluation.

All special status species that are known to occur within the Pisgah SEZ region (i.e., within 50 mi [80 km] of the center of the SEZ) are listed, with their status, nearest recorded occurrence, and habitats in Appendix J. Of these species, 54 could be affected by solar energy development within the SEZ, based on recorded occurrences or the presence of potentially suitable habitat in the area. These species, their status, and their habitats are presented in Table 9.3.12.1-1. For many of the species listed in the table, their predicted potential occurrence in the affected area is based only on a general correspondence between mapped CAReGAP land cover types and descriptions of species habitat preferences. This overall approach to identifying species in the affected area probably overestimates the number of species that actually occur in the affected area. For many of the species identified as having potentially suitable habitat in the affected area, the nearest known occurrence is more than 20 mi (32 km) away from the SEZ.

On the basis of CNDDB records and information provided by the CDFG and USFWS, there are 10 special status species that are known to occur within the affected area of the Pisgah SEZ: Emory's crucifixion-thorn, small-flowered androstephium, white-margined beardtongue, Arroyo chub, Mohave tui chub, desert tortoise, Mojave fringe-toed lizard, southwestern pond turtle, Bendire's thrasher, and Nelson's bighorn sheep. The nearest occurrences of the Arroyo chub, Mohave tui chub, and southwestern pond turtle are more than 5 mi (8 km) from the SEZ; however, these species are considered to occur within the affected area because they occur in areas that may be affected by groundwater withdrawal from the SEZ.

9.3.12.1.1 Species Listed under the ESA That Could Occur in the Affected Area

In their scoping comments on the proposed Pisgah SEZ, the USFWS expressed concern for impacts of project development within the Pisgah SEZ on the desert tortoise (a species listed as threatened under the ESA in the State of California) and the Mojave tui chub (a species listed as endangered under the ESA) (Stout 2009). Both of these species are known to occur in the affected area. These species are discussed below; additional basic information on life history, habitat needs, and threats to populations of these species is provided in Appendix J.

Mohave Tui Chub

The Mohave tui chub occurs in artificial refugia at the CDFG's Camp Cady Wildlife Area along the Mojave River, approximately 6 mi (10 km) northwest of the Pisgah SEZ. This site is one of only three known locations for this species globally (USFWS 2009b). The proximity of this location relative to the SEZ and area of indirect effects is shown in Figure 9.3.12.1-1 and summarized in Table 9.3.12.1-1.

In its scoping letter for the Pisgah SEZ, the USFWS discussed the interconnection of the groundwater system that supports the aquatic and riparian habitats of the Mojave River and Camp Cady and groundwater associated with Troy Lake (along the western portion of the SEZ). The USFWS expressed concern that groundwater withdrawals from the vicinity of Troy Lake to serve solar development on the Pisgah SEZ could contribute to the depletion of the regional groundwater system, which is already depleted, and could potentially affect the artificial habitat for the Mojave tui chub at the Camp Cady Wildlife Area by making it difficult to pump water to maintain this habitat (Stout 2009).

The USFWS has not designated critical habitat for this species.

Desert Tortoise

The desert tortoise has the potential to occur within the SEZ on the basis of observed occurrences on and near the SEZ, the presence of designated critical habitat within the area of indirect effects, and the presence of potentially suitable habitat in the SEZ (Figure 9.3.12.1-1; Table 9.3.12.1-1).

TABLE 9.3.12.1-1 Habitats, Potential Impacts, and Potential Mitigation for Special Status Species That Could Be Affected by Solar Energy Development on the Proposed Pisgah SEZ

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants						
Alkali mariposa-lily	*Calochortus striatus*	BLM-S; CA-S2; FWS-SC	Alkaline seeps, springs, and meadows at elevations between 2,600 and 4,600 ft.[h, i] Nearest recorded occurrences are 25 mi[j] northwest of the SEZ. About 107,377 acres[k] of potentially suitable habitat occurs within the SEZ region.	2,795 acres of potentially suitable habitat associated with the Troy Lake playa lost (2.6% of available potentially suitable habitat)	4,767 acres of potentially suitable habitat (4.4% of available potentially suitable habitat)	Moderate overall impact. Avoiding or minimizing disturbance of playa habitat on the SEZ could reduce impacts. In addition, pre-disturbance surveys and avoiding or minimizing disturbance of occupied habitats on the SEZ, translocation of individuals from areas of direct effect, or compensatory mitigation of direct effects on occupied habitats could reduce impacts. Note that these same potential mitigations apply to all special status plants.
Barstow woolly sunflower	*Eriophyllum mohavense*	BLM-S; CA-S2; FWS-SC	Known only from area surrounding Barstow, California on sandy or rocky substrates associated with creosotebush scrub, chenopod scrub, and playas at elevations between 2,000 and 3,000 ft. Nearest recorded occurrences are 20 mi northwest of the SEZ. About 2,677,079 acres of potentially suitable habitat occurs within the SEZ region.	18,466 acres of potentially suitable habitat lost (0.7% of available potentially suitable habitat)	111,523 acres of potentially suitable habitat (4.2% of available potentially suitable habitat)	Small overall impact. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.

TABLE 9.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Black bog-rush	*Schoenus nigricans*	CA-S2	Endemic to California on alkaline or calcareous substrates within grasslands, marshes, springs, and swamps at elevations between 500 and 6,500 ft. Nearest recorded occurrences are 45 mi from the SEZ. About 107,377 acres of potentially suitable habitat occurs within the SEZ region.	2,795 acres of potentially suitable habitat associated with the Troy Lake playa lost (2.6% of available potentially suitable habitat)	4,767 acres of potentially suitable habitat (4.4% of available potentially suitable habitat)	Moderate overall impact. Avoiding or minimizing disturbance of playa habitat on the SEZ could reduce impacts. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.
Booth's evening-primrose	*Camissonia boothii* ssp. *boothii*	CA-S2	Shrubby, open, or dry areas of Joshua tree and pinyon-juniper woodlands at elevations between 3,000 and 7,900 ft. Nearest recorded occurrences are 45 mi from the SEZ. About 597,859 acres of potentially suitable habitat occurs within the SEZ region.	879 acres of potentially suitable habitat lost (0.1% of available potentially suitable habitat)	6,585 acres of potentially suitable habitat (1.1% of available potentially suitable habitat)	Small overall impact. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.
California saw-grass	*Cladium californicum*	CA-S2	Alkaline, freshwater, and riparian habitats, including meadows, marshes, swamps, and seeps at elevations between 200 and 2,000 ft. Nearest recorded occurrences are 45 mi from the SEZ. About 118,936 acres of potentially suitable habitat occurs within the SEZ region.	2,795 acres of potentially suitable habitat associated with the Troy Lake playa lost (2.4% of available potentially suitable habitat)	4,835 acres of potentially suitable habitat (4.1% of available potentially suitable habitat)	Moderate overall impact. Avoiding or minimizing disturbance of playa habitat on the SEZ could reduce impacts. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.

TABLE 9.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Chaparral sand-verbena	*Abronia villosa* var. *aurita*	BLM-S; CA-S2	Endemic to southern California in chaparral desert sand dunes at elevations between 350 and 5,250 ft. Nearest recorded occurrences are 30 mi west of the SEZ. About 159,724 acres of potentially suitable habitat occurs within the SEZ region.	322 acres of potentially suitable habitat lost (0.2% of available potentially suitable habitat)	5,155 acres of potentially suitable habitat (3.2% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance to dunes and sand transport systems on the SEZ could reduce impacts. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.
Clokey's cryptantha	*Cryptantha clokeyi*	BLM-S; CA-S1	Mojave desertscrub on sandy or gravelly soils at elevations between 2,625 and 2,950 ft. Nearest recorded occurrences are 22 mi northwest of the SEZ. About 2,881,951 acres of potentially suitable habitat occurs within the SEZ region.	15,427 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	107,664 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.
Coulter's goldfields	*Lasthenia glabrata* ssp. *coulteri*	BLM-S; CA-S2	Endemic to California in salt marshes, swamps, playas, alkaline sinks, and vernal pools at elevations below 4,000 ft. Nearest recorded occurrences are 50 mi south of the SEZ. About 107,377 acres of potentially suitable habitat occurs within the SEZ region.	2,795 acres of potentially suitable habitat associated with the Troy Lake playa lost (2.6% of available potentially suitable habitat)	4,767 acres of potentially suitable habitat (4.4% of available potentially suitable habitat)	Moderate overall impact. Avoiding or minimizing disturbance of playa habitat on the SEZ could reduce impacts. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.

TABLE 9.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Creamy blazing-star	*Mentzelia tridentata*	BLM-S; CA-S2	Mojave desert creosotebush scrub communities on rocky and sandy substrates at elevations below 3,900 ft. Nearest recorded occurrences are 11 mi west of the SEZ. About 2,300,615 acres of potentially suitable habitat occurs within the SEZ region.	14,548 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat)	101,079 acres of potentially suitable habitat (4.4% of available potentially suitable habitat)	Small overall impact. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.
Darwin rock-cress	*Arabis pulchra* var. *munciensis*	CA-S1	Carbonate substrates along canyons, slopes, and washes at elevations between 3,600 and 6,800 ft. Nearest recorded occurrences are 50 mi from the SEZ. About 1,363,295 acres of potentially suitable habitat occurs within the SEZ region.	1,749 acres of potentially suitable rocky cliff and wash habitats lost (0.1% of available potentially suitable habitat)	42,969 acres of potentially suitable habitat (3.2% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of desert washes on the SEZ could reduce impacts. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.
Desert bedstraw	*Galium proliferum*	CA-S2	Endemic to southern California on carbonate substrates of rocky banks and ledges within Joshua tree woodlands, creosotebush scrub, Mojave desertscrub, and pinyon-juniper woodland habitats at elevations between 3,900 and 5,150 ft. Nearest recorded occurrences are 50 mi from the SEZ. About 4,179,076 acres of potentially suitable habitat occurs within the SEZ region.	16,932 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	148,726 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	Small overall impact. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.

TABLE 9.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Desert cymopterus	*Cymopterus deserticola*	BLM-S	Deep, loose, well-drained, fine to coarse sandy soils of alluvial fan basins, often in low sand dunes and on sandy slopes at elevations between 2,060 and 3,060 ft. Nearest recorded occurrences are 35 mi northwest of the SEZ. About 82,699 acres of potentially suitable habitat occurs within the SEZ region.	244 acres of potentially suitable desert wash habitat lost (0.3% of available potentially suitable habitat)	1,907 acres of potentially suitable habitat (2.3% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of dunes and sand transport systems on the SEZ could reduce impacts. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.
Desert pincushion	*Coryphantha chlorantha*	CA-S1	Gravelly bajadas, limestone or dolomite rocky slopes often in association with pinyon-juniper woodland and Joshua tree woodland communities at elevations between 150 and 7,900 ft. Nearest recorded occurrences are 40 mi from the SEZ. About 2,898,476 acres of potentially suitable habitat occurs within the SEZ region.	15,427 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	107,664 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.
Emory's crucifixion-thorn[l]	***Castela emoryi*[l]**	CA-S2	Slightly wet areas with fine-textured alluvial bottomland soils associated with basalt flows within Mojave desertscrub, non-saline playas, creosotebush scrub, and Sonoran desertscrub communities at elevations between 295 and 2,200 ft. Known to occur on the SEZ and within other portions of the affected area. About 2,989,328 acres of potentially suitable habitat occurs within the SEZ region.	18,222 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat)	112,431 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	Small overall impact. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.

TABLE 9.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Flat-seeded spurge	*Chamaesyce platysperma*	BLM-S; CA-S1; FWS-SC	Sandy substrates of desert dunes within desertscrub communities at elevations below 650 ft. Nearest recorded about 20 mi southwest of the SEZ; the species has not been recorded in the project area since 1974. About 147,861 acres of potentially suitable habitat occurs within the SEZ region.	322 acres of potentially suitable desert dune habitat lost (0.2% of available potentially suitable habitat)	5,155 acres of potentially suitable habitat (3.5% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of desert dunes and sand transport systems could reduce impacts. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species, however, translocation may not be a feasible option for this species.
Harwood's eriastrum	*Eriastrum harwoodii*	BLM-S; CA-S2	Desert dunes and other sandy habitats at elevations between 650 and 3,000 ft. Nearest recorded occurrences are 35 mi northeast of the SEZ. About 147,861 acres of potentially suitable habitat occurs within the SEZ region.	322 acres of potentially suitable desert dune habitat lost (0.2% of available potentially suitable habitat)	5,155 acres of potentially suitable habitat (3.5% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of dunes and sand transport systems on the SEZ could reduce impacts. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.

TABLE 9.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Jackass-clover	*Wislizenia refracta* ssp. *refracta*	CA-S1	Dunes, sandy washes, roadsides, and playas within creosotebush scrub, alkali sink, or desertscrub communities of the Mojave and northern Sonoran Desert at elevations between 2,000 and 2,600 ft. Nearest recorded occurrences are 30 mi from the SEZ. About 406,930 acres of potentially suitable habitat occurs within the SEZ region.	3,535 acres of potentially suitable desert dune, playa, and wash habitats lost (0.9% of available potentially suitable habitat)	13,813 acres of potentially suitable habitat (3.4% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of desert playas and washes on the SEZ could reduce impacts. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.
Latimer's woodland-gilia	*Saltugilia latimeri*	BLM-S; CA-S2	Mojave desertscrub communities, pinyon-juniper woodlands, and washes on rocky or sandy substrates at elevations between 1,300 and 6,500 ft. Nearest recorded occurrence is 35 mi east of the SEZ. About 2,981,173 acres of potentially suitable habitat occurs within the SEZ region.	15,671 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	109,571 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.
Limestone beardtongue	*Penstemon calcareus*	BLM-S; CA-S2	Mojave desertscrub communities, pinyon-juniper forests, and Joshua tree woodlands on rocky carbonate substrates at elevations between 3,280 and 6,550 ft. Nearest recorded occurrences are 45 mi east of the SEZ. About 2,898,474 acres of potentially suitable habitat occurs within the SEZ region.	15,427 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	107,664 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.

TABLE 9.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c] — Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c] — Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Little San Bernardino Mountains linanthus	*Linanthus maculatus*	BLM-S; CA-S1	Desert dunes and sandy flats within creosotebush scrub and Joshua tree woodland communities at elevations less than 6,900 ft. Nearest recorded occurrences are 30 mi south of the SEZ. About 147,861 acres of potentially suitable habitat occurs within the SEZ region.	322 acres of potentially suitable desert dune habitat lost (0.2% of available potentially suitable habitat)	5,155 acres of potentially suitable habitat (3.5% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of dunes and sand transport systems on the SEZ could reduce impacts. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.
Long-stem evening-primrose	*Oenothera longissima*	CA-S1	Restricted to Inyo and San Bernardino counties in California in seasonally mesic desertscrub, creosotebush scrub, and pinyon-juniper woodland habitat at elevations between 3,300 and 5,500 ft. Nearest recorded occurrences are 50 mi from the SEZ. About 2,898,474 acres of potentially suitable habitat occurs within the SEZ region.	15,427 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	107,664 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.
Mojave monkeyflower	*Mimulus mohavensis*	BLM-S; CA-S2; FWS-SC	Endemic to the western Mojave Desert in San Bernardino County, California on gravelly banks of desert washes at elevations below 3,900 ft. Nearest recorded occurrences are 8 mi west of the SEZ. About 82,699 acres of potentially suitable habitat occurs within the SEZ region.	244 acres of potentially suitable desert wash habitat lost (0.3% of available potentially suitable habitat)	1,907 acres of potentially suitable habitat (2.3% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of desert wash habitats on the SEZ could reduce impacts. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.

TABLE 9.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Narrow-leaved cottonwood	*Populus angustifolia*	CA-S2	Upland riparian forest habitats at elevations between 3,900 and 5,900 ft. Nearest recorded occurrences are 45 mi from the SEZ. About 11,559 acres of potentially suitable habitat occurs within the SEZ region.	0 acres of potentially suitable habitat	68 acres of potentially suitable habitat (0.6% of available potentially suitable habitat)	Small overall impact; no direct impact. No species-specific mitigation is warranted.
Palmer's mariposa-lily	*Calochortus palmeri* var. *palmeri*	BLM-S; CA-S2; FWS-SC	Moist to wet meadows or moist grassy knolls and along creeks or swales within chaparral, pinyon woodlands, and pine forest communities at elevations between 3,280 and 7,850 ft. Nearest recorded occurrences are 35 mi southwest of the SEZ. About 11,559 acres of potentially suitable habitat occurs within the SEZ region.	0 acres of potentially suitable habitat	68 acres of potentially suitable habitat (0.6% of available potentially suitable habitat)	Small overall impact; no direct impact. No species-specific mitigation is warranted.
Parish's brittlescale	*Atriplex parishii*	BLM-S; CA-S1; FWS-SC	Chenopod scrub, playas, and vernal pools in southern California at elevations between 100 and 6,200 ft. Nearest recorded occurrences are 35 mi southwest of the SEZ. About 376,464 acres of potentially suitable habitat occurs within the SEZ region.	3,918 acres of potentially suitable desert playa and wash habitats lost (1.0% of available potentially suitable habitat)	10,444 acres of potentially suitable habitat (2.8% of available potentially suitable habitat)	Moderate overall impact. Avoiding or minimizing disturbance of desert playa habitats on the SEZ could reduce impacts. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.

TABLE 9.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Parish's club-cholla	*Grusonia parishii*	CA-S2	Silty, sandy, or gravelly flats, dunes, and hills within Joshua tree woodland, and desertscrub communities at elevations between 100 and 5,000 ft. Nearest recorded occurrences are 45 mi from the SEZ. About 3,150,630 acres of potentially suitable habitat occurs within the SEZ region.	18,945 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat)	129,785 acres of potentially suitable habitat (4.1% of available potentially suitable habitat)	Small overall impact. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.
Parish's phacelia	*Phacelia parishii*	BLM-S; CA-S1; FWS-SC	Mojave desertscrub communities and playas on alkaline-clay soils. Elevation ranges between 1,800 and 3,900 ft. Nearest recorded occurrences are 12 mi northwest of the SEZ. About 2,989,326 acres of potentially suitable habitat occurs within the SEZ region.	18,222 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat)	112,431 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	Small overall impact. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.
Prairie wedge grass	*Sphenopholis obtusata*	CA-S2	Cismontane woodland, foothill woodland, stream banks, ponds, and mesic meadows and seeps at elevations between 990 and 6,500 ft. Nearest recorded occurrences are 45 mi from the SEZ. About 11,559 acres of potentially suitable habitat occurs within the SEZ region.	0 acres of potentially suitable habitat	68 acres of potentially suitable habitat (0.6% of available potentially suitable habitat)	Small overall impact; no direct impact. No species-specific mitigation is warranted.
Purple-nerve cymopterus	*Cymopterus multinervatus*	CA-S2	Sandy or gravelly slopes within desertscrub, Joshua tree woodland, and pinyon-juniper woodland communities at elevations between 2,600 and 5,900 ft. Nearest recorded occurrences are 6 mi southwest of the SEZ. About 2,898,476 acres of potentially suitable habitat occurs within the SEZ region.	15,427 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	107,664 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.

TABLE 9.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Salt Spring checkerbloom	*Sidalcea neomexicana*	CA-S2	Alkaline or mesic substrates within riparian wetlands, marshes, springs, chaparral, coastal scrub, coniferous forest, desertscrub, and playas habitats at elevations between 50 and 5,000 ft. Nearest recorded occurrences are 35 mi from the SEZ. About 3,012,750 acres of potentially suitable habitat occurs within the SEZ region.	18,222 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat)	112,499 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.
Slender cottonheads	*Nemacaulis denudata* var. *gracilis*	CA-S2	Sandy soils within coastal dunes, desert dunes, creosotebush scrub, and desertscrub communities at elevations below 1,300 ft. Nearest recorded occurrences are 35 mi from the SEZ. About 3,029,812 acres of potentially suitable habitat occurs within the SEZ region.	15,749 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	112,819 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.
Small-flowered androsteph-ium	***Androstephium breviflorum***	CA-S1	Dry sandy to rocky soil substrates within desert dunes, creosotebush scrub, and desertscrub at elevations between 720 and 2,100 ft. Known to occur on the SEZ and within other portions of the affected area. About 3,130,736 acres of potentially suitable habitat occurs within the SEZ region.	18,942 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat)	129,330 acres of potentially suitable habitat (4.1% of available potentially suitable habitat)	Small overall impact. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.
Spear-leaf matelea	*Matelea parvifolia*	CA-S2	Rocky substrates within creosotebush scrub and desertscrub communities. Elevation ranges between 1,450 and 3,600 ft. Nearest recorded occurrences are 40 mi from the SEZ. About 2,881,951 acres of potentially suitable habitat occurs within the SEZ region.	15,427 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	107,664 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.

TABLE 9.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Stephens' beardtongue	*Penstemon stephensii*	BLM-S; CA-S2; FWS-SC	Restricted to Inyo and San Bernardino counties, California on rocky (usually carbonate) substrates, including rock crevices, cliffs, rocky slopes, and washes associated with pinyon-juniper and creosotebush scrub communities at elevations between 3,900 and 6,550 ft. Nearest recorded occurrences are 40 mi east of the SEZ. About 3,663,910 acres of potentially suitable habitat occurs within the SEZ region.	16,297 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	144,048 acres of potentially suitable habitat (3.9% of available potentially suitable habitat)	Small overall impact. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.
Three-awned grama	*Bouteloua trifida*	CA-S2	Eastern Mojave Desert mountains on dry, rocky, often calcareous slopes within desertscrub communities at elevations between 2,300 and 6,500 ft. Nearest recorded occurrence is 45 mi east of the SEZ. About 2,881,951 acres of potentially suitable habitat occurs within the SEZ region.	15,427 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	107,664 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.
Tidestrom's milkvetch	*Astragalus tidestromii*	CA-S2	East-central Mojave Desert mountains on sandy or gravelly substrates of carbonate derivation within creosotebush and desertscrub communities at elevations between 1,950 and 5,200 ft. Nearest recorded occurrences are 35 mi from the SEZ. About 2,881,951 acres of potentially suitable habitat occurs within the SEZ region.	15,427 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	107,664 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.

TABLE 9.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Utah glasswort	*Sarcocornia utahensis*	CA-S1	Alkaline substrates within chenopod scrub and playa habitats at elevations near 1,050 ft. Known to occur as near as Harper Lake, approximately 45 mi west of the SEZ. About 376,464 acres of potentially suitable habitat occurs within the SEZ region.	3,918 acres of potentially suitable desert playa and wash habitats lost (1.0% of available potentially suitable habitat)	10,444 acres of potentially suitable habitat (2.8% of available potentially suitable habitat)	Moderate overall impact. Avoiding or minimizing disturbance of desert playa habitats on the SEZ could reduce impacts. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.
White-bracted spineflower	*Chorizanthe xanti* var. *leucotheca*	BLM-S; CA-S2	Mojave desertscrub communities and pinyon-juniper woodlands on sandy or gravelly soils at elevations below 3,925 ft. Nearest recorded occurrences are 45 mi south of the SEZ. About 2,898,476 acres of potentially suitable habitat occurs within the SEZ region.	15,427 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	107,664 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.
White-margined beardtongue	***Penstemon albomarginatus***	BLM-S; CA-S1; FWS-SC	Desert sand dune habitats and Mojave desertscrub communities at elevations below 3,600 ft. Known to occur on the SEZ and in other portions of the affected area. About 3,029,810 acres of potentially suitable habitat occurs within the SEZ region.	15,749 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	112,819 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact. See alkali mariposa-lily for a list of potential mitigations applicable to all special status plant species.

TABLE 9.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Arthropods						
Borrego parnopes cuckoo wasp	*Parnopes borregoensis*	CA-S1	Endemic to California, where it is known from the Sonoran and Mojave Deserts. General habitat preferences are poorly understood. May occur in desertscrub, creosotebush scrub, yucca and cholla cactus, saltbush, and desert dune communities. Nearest recorded occurrence is 45 mi south of the SEZ. About 3,029,812 acres of potentially suitable habitat occurs within the SEZ region.	15,749 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	112,819 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoidance of occupied habitats on the SEZ; or compensatory mitigation of direct effects on occupied habitats could reduce impacts.
Fish						
Arroyo chub	***Gila orcuttii***	CA-S2	Endemic to the southern coastal drainages of California in headwaters, creeks, and small to medium rivers; often in intermittent streams. Nearest recorded occurrences are from the Mojave River, approximately 13 mi north of the SEZ. The species is unlikely to occur in the affected area due to lack of suitable habitat.	0 acres of potentially suitable habitat	0 acres of potentially suitable habitat	Small to large overall impact depending on the volume of groundwater withdrawals. Limiting withdrawals from this regional groundwater system could reduce impacts on this species to negligible levels. Note that these potential impact magnitudes and potential mitigation measures apply to all groundwater-dependent special status species that may occur in the SEZ region.

TABLE 9.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Fish (Cont.)						
Mohave tui chub	***Gila bicolor mohavensis***	ESA-E; CA-E; CA-FP; CA-S2	Restricted to a few known locations in San Bernardino County, California in deep pools or shallow portions of mineralized, alkaline waters. Formerly in mainstream Mojave River; now in lakes and mineral spring pools. Nearest recorded occurrences are from man-made ponds created in the Camp Cady Wildlife Area, approximately 6 mi northwest (downgradient) of the SEZ. The species is unlikely to occur in the affected area due to lack of suitable habitat.	0 acres of potentially suitable habitat	0 acres of potentially suitable habitat	Small to large overall impact depending on the volume of groundwater withdrawals. See Arroyo chub for potential impacts and mitigation measures applicable to all groundwater-dependent special status species. The potential for impact and need for mitigation should be determined in consultation with the USFWS and CDFG.

TABLE 9.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Reptiles						
Desert tortoise	***Gopherus agassizii***	ESA-T; CA-T; CA-S2	Desert creosotebush communities on firm soils for digging burrows, often along riverbanks, washes, canyon bottoms, creosote flats, and desert oases. Known to occur on the SEZ and in other portions of the affected area. About 4,001,056 acres of potentially suitable habitat occurs within the SEZ region.	16,720 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	143,604 acres of potentially suitable habitat (3.6% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance of occupied habitats on the SEZ, translocation of individuals from areas of direct effect, or compensatory mitigation of direct effects on occupied habitats could reduce impacts. The potential for impact and need for mitigation should be determined in consultation with the USFWS and CDFG.

TABLE 9.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Reptiles (Cont.)						
Mojave fringe-toed lizard	***Uma scoparia***	BLM-S	Sparsely vegetated desert areas with fine windblown sand, including dunes, flats, and washes at elevations below 3,000 ft. Known to occur on the SEZ and in other portions of the affected area. About 3,849,554 acres of potentially suitable habitat occurs within the SEZ region.	19,218 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	156,798 acres of potentially suitable habitat (4.1% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of desert dunes and sand transport systems or washes could reduce impacts. In addition, pre-disturbance surveys and avoiding or minimizing disturbance of occupied habitats on the SEZ, or compensatory mitigation of direct effects, could reduce impacts.
Southwestern pond turtle	***Actinemys marmorata pallida***	CA-S2	Ponds, lakes, rivers, streams, creeks, marshes, and irrigation ditches within woodland, forest, and grassland habitats. Slow-moving, shallow waters with abundant vegetation, and either rocky or muddy bottoms. Nearest recorded occurrences are from the Mojave River, approximately 8 mi northwest of the SEZ. The species is unlikely to occur in the affected area due to lack of suitable habitat.	0 acres of potentially suitable habitat	0 acres of potentially suitable habitat	Small to large overall impact depending on the volume of groundwater withdrawals. See Arroyo chub for potential impacts and mitigation measures applicable to all groundwater-dependent special status species.

TABLE 9.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Birds						
Bendire's thrasher	***Toxostoma bendirei***	BLM-S	Summer resident in the SEZ region. Flats associated with succulent shrub and Joshua tree woodlands of the Mojave Desert. Known to occur on the SEZ and in other portions of the affected area. About 2,898,476 acres of potentially suitable habitat occurs within the SEZ region.	15,427 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	107,664 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance of occupied habitats, especially nesting habitats on the SEZ, or compensatory mitigation of direct effects on occupied habitats could reduce impacts.
Ferruginous hawk	*Buteo regalis*	BLM-S; FWS-SC	Winter resident in the SEZ region. Open grasslands, sagebrush flats, desertscrub, desert valleys, and fringes of pinyon-juniper habitats. Known to occur in San Bernardino County. About 2,988,171 acres of potentially suitable habitat occurs within the SEZ region.	15,598 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	110,385 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact on foraging habitat only. Avoidance of direct impacts on all foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effect.

TABLE 9.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Birds (Cont.)						
Western burrowing owl	*Athene cunicularia hypugaea*	BLM-S; CA-S2; FWS-SC	Year-round resident in the SEZ region. Open areas with short, sparse vegetation, including grasslands, agricultural fields, and disturbed areas. Nests in burrows created by mammals or tortoises; local abundance is determined by small mammal prey abundance. Nearest recorded occurrence is 30 mi west of the SEZ. About 4,827,058 acres of potentially suitable habitat occurs within the SEZ region.	23,932 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	180,886 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance of occupied burrows and habitats in the area of direct effect or compensatory mitigation of direct effects on occupied habitats could reduce impacts.
Mammals						
Mohave ground squirrel	*Spermophilus mohavensis*	BLM-S; CA-T; CA-S2	Open desertscrub, grasslands, and Joshua tree woodlands in the Mojave Desert in San Bernardino County at elevations between 1,800 and 5,000 ft. Utilizes burrows at the bases of shrubs. Nearest recorded occurrence is in the vicinity of Barstow, California, approximately 15 mi west of the SEZ. About 2,898,476 acres of potentially suitable habitat occurs within the SEZ region.	15,427 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	107,664 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance of discovered populations and occupied habitats on the SEZ, or compensatory mitigation of direct effects on occupied habitats, could reduce impacts.

TABLE 9.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Mammals (Cont.)						
Nelson's bighorn sheep	***Ovis canadensis nelsoni***	BLM-S; FWS-SC	Open, steep rocky terrain in mountainous habitats of the eastern Mojave and Sonoran Deserts in California. Rarely uses desert lowlands, but may use them as corridors for travel between mountain ranges. Known to occur in the affected area from the Cady Mountains within 5 mi northeast of the SEZ. Suitable mountainous habitat does not exist on the site, but the species may migrate through the SEZ. About 1,846,238 acres of potentially suitable habitat occurs within the SEZ region.	20,578 acres of potentially suitable habitat lost (1.1% of available potentially suitable habitat)	126,778 acres of potentially suitable habitat (6.9% of available potentially suitable habitat)	Moderate overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance of occupied habitats within the SEZ and habitats that serve as movement corridors could further reduce impacts.
Pallid bat	*Antrozous pallidus*	BLM-S; CA-SC; FWS-SC	Year-round resident in the SEZ region. Low-elevation desert communities, including grasslands, shrublands, and woodlands. Roosts in caves, crevices, and mines. Nearest recorded occurrence is from the Mojave River, approximately 6 mi northwest of the SEZ. About 4,230,325 acres of potentially suitable habitat occurs within the SEZ region.	16,932 acres of potentially suitable habitat lost (0.4% of available potentially suitable habitat)	148,804 acres of potentially suitable habitat (3.5% of available potentially suitable habitat)	Small overall impact on mostly foraging habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of discovered roost areas on the SEZ could reduce impacts.
Spotted bat	*Euderma maculatum*	BLM-S; CA-S2; CA-SC; FWS-SC	Year-round resident in the SEZ region. Arid deserts, grasslands, and mixed conifer forests at elevations below 9,800 ft. Primarily forages within riparian habitats and washes. Roosts in rock crevices along cliffs. Nearest recorded occurrence is 45 mi south of the SEZ. About 2,893,510 acres of potentially suitable habitat occurs within the SEZ region.	15,427 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	107,732 acres of potentially suitable habitat (3.7% of available potentially suitable habitat)	Small overall impact on mostly foraging habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of discovered roost areas on the SEZ could reduce impacts.

TABLE 9.3.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Mammals (Cont.)						
Townsend's big-eared bat	*Corynorhinus townsendii*	BLM-S; CA-S2; CA-SC; FWS-SC	Year-round resident in the SEZ region in all habitats but subalpine and alpine habitats. Roosts in caves, mines, tunnels, buildings, or other man-made structures. Nearest recorded occurrence is from the Mojave River, approximately 7 mi northwest of the SEZ. About 4,808,761 acres of potentially suitable habitat occurs within the SEZ region.	23,950 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	181,086 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	Small overall impact on mostly foraging habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of discovered roost areas on the SEZ could reduce impacts.
Western mastiff bat	*Eumops perotis californicus*	BLM-S; CA-SC; FWS-SC	Year-round resident in the SEZ region. in many open semiarid habitats, including conifer and deciduous woodlands, shrublands, grasslands, chaparral, and urban areas. Roosts in crevices in cliff faces, buildings, and tall trees. Nearest recorded occurrence is 32 mi southwest of the SEZ. About 4,808,761 acres of potentially suitable habitat occurs within the SEZ region.	23,950 acres of potentially suitable habitat lost (0.5% of available potentially suitable habitat)	181,086 acres of potentially suitable habitat (3.8% of available potentially suitable habitat)	Small overall impact on mostly foraging habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of discovered roost areas on the SEZ could reduce impacts.

[a] BLM-S = listed as a sensitive species by the BLM; CA-S1 = ranked as S1 in the State of California; CA-S2 = ranked as S2 in the State of California; CA-SC = species of concern in the State of California; CA-E = listed as endangered by the State of California; CA-T = listed as threatened by the State of California; CA-FP = California fully protected species; ESA-E = listed as endangered under the ESA; ESA-UR = under review for ESA listing; FWS-SC = USFWS species of concern.

[b] For plant and invertebrate species, potentially suitable habitat was determined using CAReGAP land cover types. For reptile, bird, and mammal species, potentially suitable habitat was determined using CAReGAP habitat suitability models as well as CAReGAP land cover models. Area of potentially suitable habitat for each species is presented for the SEZ region, defined as the area within 50 mi (80 km) of the SEZ center.

[c] Maximum area of potentially suitable habitat that could be affected relative to availability within the SEZ region. Habitat availability for each species within the region was determined using CAReGAP habitat suitability and land cover models. This approach probably overestimates the amount of suitable habitat in the project area. Impacts of access road and transmission line construction, upgrade, or operation are not assessed in this evaluation due to the proximity of existing infrastructure to the SEZ.

Footnotes continued on next page.

TABLE 9.3.12.1-1 (Cont.)

[d] Direct effects within the SEZ consist of the ground-disturbing activities associated with construction and maintenance of an altered environment associated with operations.

[e] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary. Indirect effects include effects from surface runoff, dust, noise, lighting, etc., from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance away from the SEZ.

[f] Overall impact magnitude categories were based on professional judgment and include (1) *small*: $\leq$1% of the population or its habitat would be lost, and the activity would not result in a measurable change in carrying capacity or population size in the affected area; (2) *moderate*: >1 but $\leq$10% of the population or its habitat would be lost and the activity would result in a measurable but moderate (not destabilizing) change in carrying capacity or population size in the affected area; (3) *large*: >10% of a population or its habitat would be lost and the activity would result in a large, measurable, and destabilizing change in carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects because those effects would be difficult to mitigate. Programmatic design features would reduce most indirect effects to negligible levels.

[g] Species-specific mitigations are suggested here but final mitigations should be developed in consultation with state and federal agencies, and should be based on pre-disturbance surveys.

[h] To convert ft to m, multiply by 0.3048.

[i] Elevations in the areas of direct and indirect effect range from about 1,750 ft (530 m) to 4,650 ft (1,420 m).

[j] To convert mi to km, multiply by 1.609.

[k] To convert acres to km^2, multiply by 0.004047.

[l] Species in bold text have been recorded or have designated critical habitat in the affected area.

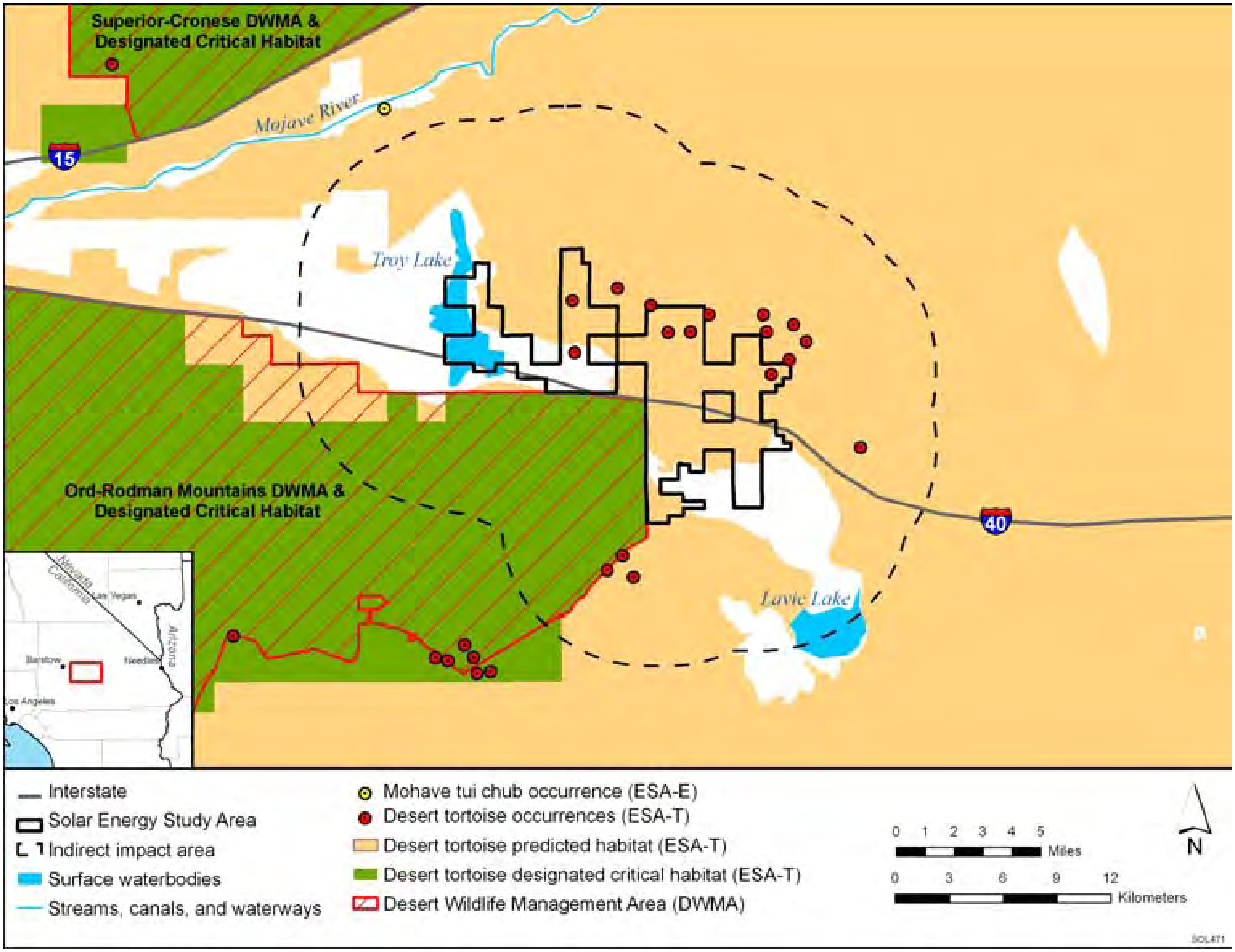

FIGURE 9.3.12.1-1 Known or Potential Occurrences of Species Listed as Endangered or Threatened under the ESA That May Occur in the Proposed Pisgah SEZ Affected Area (Sources: CDFG 2010b; USGS 2010a)

The desert tortoise occurs in the Ord-Rodman DWMA, which is adjacent to the southern boundary of the proposed Pisgah SEZ within the area of indirect effects. In 2007, surveys for desert tortoises were conducted by the USFWS Desert Tortoise Recovery Office in areas that overlap the Pisgah SEZ (Stout 2009). On the basis of these survey results, the USFWS estimated a desert tortoise density of about 3.5 individuals/km^2 within the 663,000-acre (2,682-km^2) survey area. Assuming the density across the Pisgah SEZ was similar to that within the survey area, the USFWS estimated that the SEZ may support up to 260 desert tortoises.

CNDDB records of desert tortoises within the SEZ are located primarily from the northern portion of the SEZ near the southern slopes of the Cady Mountains (Figure 9.3.12.1-1). According to the CAReGAP habitat suitability model, potentially suitable habitat for the desert tortoise occurs throughout the majority of the SEZ and area of indirect effects (Figure 9.3.12.1-1; Table 9.3.12.1-1). In addition, the USGS desert tortoise model (Nussear et al. 2009) predicts the presence of highly suitable habitat (modeled suitability value ≥0.8 out of 1.0) throughout the majority of the SEZ.

Designated critical habitat for this species does not occur on the SEZ, but adjacent critical habitat occurs south of the SEZ in the area of indirect effects within the Ord-Rodman DWMA. Designated critical habitat for the desert tortoise also occurs in the Superior-Cronese DWMA, approximately 10 mi (16 km) northwest of the SEZ. The Pisgah SEZ is situated between the Superior-Cronese (to the northwest) and Ord-Rodman (to the south) Critical Habitat units (Figure 9.3.12-1); therefore, the SEZ may provide important connectivity between these two critical habitat units.

9.3.12.1.2 BLM-Designated Sensitive Species

There are 29 BLM-designated sensitive species that may occur in the affected area of the Pisgah SEZ (Table 9.3.12.1-1). BLM-designated sensitive species that may occur in the Pisgah SEZ affected area include the following (1) plants: alkali mariposa-lily, Barstow woolly sunflower, chaparral sand-verbena, Clokey’s cryptantha, Coulter’s goldfields, creamy blazing-star, desert cymopterus, flat-seeded spurge, Harwood’s eriastrum, Latimer’s woodland-gilia, limestone beardtongue, Little San Bernardino Mountains linanthus, Mojave monkeyflower, Palmer’s mariposa-lily, Parish’s brittlescale, Parish’s phacelia, Stephen’s beardtongue, white-bracted spineflower, and white-margined beardtongue; (2) reptiles: Mojave fringe-toed lizard; (3) birds: Bendire’s thrasher, ferruginous hawk, and western burrowing owl; and (4) mammals: Mojave ground squirrel, Nelson’s bighorn sheep, pallid bat, spotted bat, Townsend’s big-eared bat, and western mastiff bat. Of these species, the white-margined beardtongue, Mojave fringe-toed lizard, Bendire’s thrasher, and Nelson’s bighorn sheep have been recorded in the affected area. Habitats in which these species are found, the amount of potentially suitable habitat in the affected area, and known locations of the species relative to the SEZ are discussed below and presented in Table 9.3.12.1-1.

Alkali Mariposa-Lily

The alkali mariposa-lily is a perennial forb in the lily family that is known only from wetlands in the western Mojave Desert region of southern California. It inhabits alkaline seeps, springs, and meadows. The species is not known to occur on the SEZ, but potentially suitable habitat does occur there and in other portions of the affected area (Table 9.3.12.1-1). The nearest known occurrence of the species is about 25 mi (40 km) northwest of the Pisgah SEZ.

Barstow Woolly Sunflower

The Barstow woolly sunflower is an annual forb in the aster family that is restricted to the Mojave Desert region surrounding Barstow, California. The species inhabits sandy and rocky substrates within desertscrub communities and playas. The species is not known to occur on the SEZ, but potentially suitable habitat does occur there and in other portions of the affected area (Table 9.3.12.1-1). The nearest known occurrence of the species is about 20 mi (32 km) northwest of the Pisgah SEZ.

Chaparral Sand-Verbena

The chaparral sand-verbena is a flowering herb that is endemic to southern California. It historically occurred approximately 30 mi (48 km) west of the Pisgah SEZ, but it is currently only known to occur in Riverside and Orange Counties outside of the area of indirect effects. Although the species has not been recently recorded near the SEZ, potentially suitable sand dune habitat does occur there and in other portions of the affected area (Table 9.3.12.1-1).

Clokey's Cryptantha

The Clokey's cryptantha is an annual forb in the borage family that is endemic to southern California and known from only a few locations near Barstow in San Bernardino County. It inhabits desertscrub communities on sandy or gravelly soils. The species is not known to occur on the SEZ, but potentially suitable habitat does occur there and in other portions of the affected area (Table 9.3.12.1-1). The nearest known occurrence of the species is about 22 mi (35 km) northwest of the Pisgah SEZ.

Coulter's Goldfields

The Coulter's goldfields is an annual forb in the aster family that is endemic to southern California and northern Mexico. It inhabits salt marshes, swamps, playas, alkaline sinks, and vernal pools. The species is not known to occur on the SEZ, but potentially suitable habitat does occur there and in other portions of the affected area (Table 9.3.12.1-1). The nearest known occurrence of the species is about 50 mi (80 km) south of the Pisgah SEZ.

Creamy Blazing-Star

The creamy blazing-star is an annual forb in the aster family that is endemic to the Mojave Desert in southern California. It inhabits desert creosotebush scrub communities on rocky and sandy substrates. The species is not known to occur on the SEZ, but potentially suitable habitat does occur there and in other portions of the affected area (Table 9.3.12.1-1). The nearest known occurrence of the species is about 11 mi (18 km) west of the Pisgah SEZ.

Desert Cymopterus

The desert cymopterus is a perennial forb in the carrot family that is endemic to the western Mojave Desert in southern California. It inhabits deep, loose, well-drained, fine to coarse sandy soils of alluvial fan basins and desert dunes. The species is not known to occur on the SEZ, but potentially suitable habitat does occur there and in other portions of the affected area (Table 9.3.12.1-1). The nearest known occurrence of the species is about 35 mi (56 km) northwest of the Pisgah SEZ.

Flat-Seeded Spurge

The flat-seeded spurge is an annual forb in the spurge family that is known only from the Mojave and Sonoran Deserts in southern California and southwestern Arizona. The species inhabits sandy substrates of dunes within desertscrub communities. The species historically occurred about 20 mi (32 km) southwest of the Pisgah SEZ but has not been recorded in the SEZ region since 1974. It is not known to occur on the SEZ, but potentially suitable habitat does occur there and in other portions of the affected area (Table 9.3.12.1-1).

Harwood's Eriastrum

The Harwood's eriastrum is an annual forb in the phlox family that is known only from the Mojave Desert in southern California where it inhabits desert dunes. The species is not known to occur on the SEZ, but potentially suitable habitat does occur there and in other portions of the affected area (Table 9.3.12.1-1). The nearest known occurrence of the species is about 35 mi (56 km) northeast of the Pisgah SEZ.

Latimer's Woodland-Gilia

The Latimer's woodland-gilia is an annual forb in the phlox family that is endemic to southern California from San Bernardino and Riverside Counties. It inhabits desertscrub, washes, and pinyon-juniper woodland communities on rocky or sandy substrates. The species is not known to occur on the SEZ, but potentially suitable habitat does occur there and in other portions of the affected area (Table 9.3.12.1-1). The nearest known occurrence of the species is about 35 mi (56 km) east of the Pisgah SEZ.

Limestone Beardtongue

The limestone beardtongue is a perennial forb in the figwort family that is endemic to the mountains of the Mojave Desert in southern California. It inhabits desertscrub communities, pinyon-juniper forests, and Joshua tree woodlands. The species is not known to occur on the SEZ, but potentially suitable habitat does occur there and in other portions of the affected area (Table 9.3.12.1-1). The nearest known occurrence of the species is about 45 mi (72 km) east of the Pisgah SEZ.

Little San Bernardino Mountains Linanthus

The Little San Bernardino Mountains linanthus is an annual forb in the phlox family that is endemic to southern California in Riverside and San Bernardino Counties. It inhabits desert dunes and sandy flats within creosotebush and Joshua tree woodland communities. The species is not known to occur on the SEZ, but potentially suitable habitat does occur there and in other portions of the affected area (Table 9.3.12.1-1). The nearest known occurrence of the species is about 30 mi (48 km) south of the Pisgah SEZ.

Mojave Monkeyflower

The Mojave monkeyflower is an annual forb in the figwort family that is endemic to San Bernardino County, California, where it inhabits the gravelly banks of desert washes. The species is not known to occur on the SEZ, but potentially suitable habitat does occur there and in other portions of the affected area (Table 9.3.12.1-1). The nearest known occurrence of the species is about 8 mi (13 km) west of the Pisgah SEZ.

Palmer's Mariposa-Lily

The Palmer's mariposa-lily is a perennial forb in the lily family that is endemic to California. It inhabits moist to wet meadows, grassy knolls, creek sides, pinyon-juniper woodlands, and pine forests. The species is not known to occur on the SEZ, but potentially suitable habitat does occur there and in other portions of the affected area (Table 9.3.12.1-1). The nearest known occurrence of the species is about 35 mi (56 km) southwest of the Pisgah SEZ.

Parish's Brittlescale

The Parish's brittlescale is an annual forb in the goosefoot family that is known from only 11 occurrences in California. It is restricted to desertscrub, playas, and vernal pools. The species is not known to occur on the SEZ, but potentially suitable habitat does occur there and in other portions of the affected area (Table 9.3.12.1-1). The nearest known occurrence of the species is about 35 mi (56 km) southwest of the Pisgah SEZ.

Parish's Phacelia

The Parish's phacelia is an annual forb in the waterleaf family that is known from southwestern Nevada and the vicinity of Barstow, California, where it inhabits desertscrub and playa communities on alkaline-clay soils. The species is not known to occur on the SEZ, but potentially suitable habitat does occur there and in other portions of the affected area (Table 9.3.12.1-1). The nearest known occurrence of the species is about 12 mi (19 km) northwest of the Pisgah SEZ.

Stephen's Beardtongue

The Stephen's beardtongue is a perennial forb in the figwort family that is endemic to Inyo and San Bernardino Counties, California. It inhabits rocky substrates, including rock crevices, cliffs, rocky slopes, washes, and pinyon-juniper and creosote scrub communities. The species is not known to occur on the SEZ, but potentially suitable habitat does occur there and in other portions of the affected area (Table 9.3.12.1-1). The nearest known occurrence of the species is about 40 mi (64 km) east of the Pisgah SEZ.

White-Bracted Spineflower

The white-bracted spineflower is an annual forb in the buckwheat family that is endemic to the Mojave Desert of southern California, where it inhabits desertscrub communities and pinyon-juniper woodlands. The species is not known to occur on the SEZ, but potentially suitable habitat does occur there and in other portions of the affected area (Table 9.3.12.1-1). The nearest known occurrence of the species is about 45 mi (72 km) south of the Pisgah SEZ.

White-Margined Beardtongue

The white-margined beardtongue is a perennial forb in the figwort family that occurs in the deserts of Arizona, California, and Nevada. In California, it is known from fewer than 20 locations. It inhabits desert dunes and desertscrub communities of the Mojave Desert. This species is known to occur on the SEZ; potentially suitable habitat exists on the SEZ and in other portions of the affected area (Table 9.3.12.1-1).

Mojave Fringe-Toed Lizard

The Mojave fringe-toed lizard is a fairly small, smooth-skinned lizard that inhabits desert sand dune habitats in the Mojave Desert of southern California. The species occurs as scattered populations in specialized dune habitats composed of fine, loose, windblown sand deposits. The species, and potentially suitable dune habitats for it, are known to occur on the Pisgah SEZ and in other portions of the affected area (Table 9.3.12.1-1).

Bendire's Thrasher

The Bendire's thrasher is a small neotropical migrant bird that is a summer breeding resident in southern California. This species inhabits desert succulent shrub and Joshua tree habitats in the Mojave Desert where it is associated with sagebrush (*Artemisia* spp.), pinyon-juniper woodlands, cholla cactus, Joshua tree, palo verde, mesquite, and agave species. The species, and potentially suitable scrub and woodland habitats for it, are known to occur on the SEZ and in other portions of the affected area (Table 9.3.12.1-1).

Ferruginous Hawk

The ferruginous hawk is a winter resident and migrant in the Pisgah SEZ region. The species inhabits open grasslands, sagebrush flats, desertscrub, and the edges of pinyon-juniper woodlands. This species is known to occur in San Bernardino County, California, and potentially suitable foraging habitat occurs on the SEZ and in other portions of the affected area (Table 9.3.12.1-1).

Western Burrowing Owl

The western burrowing owl is a year-round resident of open, dry grasslands and desert habitats in southern California and Arizona. The species occurs locally in open areas with sparse vegetation. The nearest recorded occurrences are 30 mi (48 km) west of the Pisgah SEZ. Potentially suitable foraging and nesting habitat may occur on the SEZ and in other portions of the affected area (Table 9.3.12.1-1). The availability of nest sites (burrows) within the affected area has not been determined, shrubland habitat that may be suitable for either foraging or nesting occurs throughout the affected area.

Mojave Ground Squirrel

The Mohave ground squirrel is restricted to the San Bernardino, Los Angeles, Kern, and Inyo Counties of southern California. It inhabits Mojave Desertscrub, alkali desertscrub, grasslands, and Joshua tree woodlands. The species is not known to occur on the SEZ, but potentially suitable habitat does occur there and in other portions of the affected area (Table 9.3.12.2-1). The nearest known occurrence of the species is about 15 mi (24 km) west of the Pisgah SEZ.

Nelson's Bighorn Sheep

The Nelson's bighorn sheep is one of several subspecies of bighorn sheep known to occur in the southwestern United States. This species occurs in desert mountain ranges in Arizona, California, Nevada, Oregon, and Utah. The Nelson's bighorn sheep uses primarily montane shrubland, forest, and grassland habitats, and may utilize desert valleys as corridors for travel between range habitats. In California, the species is known from the desert mountain ranges from the White Mountains, south to the San Bernardino Mountains, and southeastward to the Mexican border. The nearest recorded occurrences are from the Cady Mountains about 5 mi (8 km) northeast of the Pisgah SEZ. The species is also known to occur in the Rodman Mountains outside of the affected area, approximately 10 mi (16 km) west of the Pisgah SEZ. The SEZ and other portions of the affected area may provide important habitat for sheep travelling between these two ranges (Table 9.3.12.1-1).

Pallid Bat

The pallid bat is a large, pale bat with large ears that is locally common in desert grasslands and shrublands in the southwestern United States. It roosts in caves, crevices, and mines. The species is a year-round resident throughout southern California. The nearest recorded occurrence is from the North Algodones Dunes Wilderness, approximately 18 mi (29 km) north of the Pisgah SEZ. Potentially suitable habitat may occur on the SEZ and in other portions of the affected area (Table 9.3.12.1-1). The potentially suitable habitat on the SEZ and in the area of indirect effects could include foraging and roosting habitat. On the basis of an evaluation of land cover types, approximately 1,500 acres (6 km^2) and 41,000 acres (166 km^2) of rocky cliffs and outcrops on the SEZ and in the area of direct effects, respectively, could be potentially suitable roosting habitat for this species.

Spotted Bat

The spotted bat is considered a rare year-round resident of southern California, where it forages in mountain foothills, desert shrublands, grasslands, washes, riparian areas, and mixed conifer forests. The species roosts in rock crevices along cliffs. The nearest recorded occurrences are approximately 45 mi (72 km) south of the Pisgah SEZ. Potentially suitable habitat may occur on the SEZ and in other portions of the affected area (Table 9.3.12.1-1). The potentially suitable habitat on the SEZ and in the area of indirect effects could include foraging and roosting habitat. On the basis of an evaluation of land cover types, approximately 1,500 acres (6 km^2) and 41,000 acres (166 km^2) of rocky cliffs and outcrops on the SEZ and in the area of direct effects, respectively, could be potentially suitable roosting habitat for this species.

Townsend's Big-Eared Bat

The Townsend's big-eared bat is widely distributed throughout the western United States. In California, the species forages year-round in a wide variety of desert and non-desert habitats. The species roosts in caves, mines, tunnels, buildings, and other man-made structures. The nearest recorded occurrences are approximately 35 mi (56 km) from the Pisgah SEZ. Potentially suitable habitat may occur on the SEZ and in other portions of the affected area (Table 9.3.12.1-1). The potentially suitable habitat on the SEZ and in the area of indirect effects could include foraging and roosting habitat. On the basis of an evaluation of land cover types, approximately 1,500 acres (6 km^2) and 41,000 acres (166 km^2) of rocky cliffs and outcrops on the SEZ and in the area of direct effects, respectively, could be potentially suitable roosting habitat for this species.

Western Mastiff Bat

The western mastiff bat is a large, uncommon resident of southern California and western Arizona. The species forages in many open semiarid habitats, including conifer and deciduous woodlands, shrublands, grassland, and urban areas. It roosts in crevices, trees, and buildings. The nearest recorded occurrences are 16 mi (26 km) west of the Pisgah SEZ. Potentially suitable habitat may occur on the SEZ and in other portions of the affected area (Table 9.3.12.1-1). The potentially suitable habitat on the SEZ and in the area of indirect effects could include foraging and roosting habitat. On the basis of an evaluation of land cover types, approximately 1,500 acres (6 km^2) and 41,000 acres (166 km^2) of rocky cliffs and outcrops on the SEZ and in the area of direct effects, respectively, could be potentially suitable roosting habitat for this species.

9.3.12.1.3 State-Listed Species

There are three species that are listed by the State of California that may occur in the Pisgah SEZ affected area (Table 9.3.12.2-1). Of these species, there is one fish species (Mojave tui chub), one reptile species (desert tortoise), and one mammal species (Mohave ground squirrel). Each of these species are discussed previously due to their status under the ESA (Section 9.3.12.1.1) or BLM (Section 9.3.12.1.2).

9.3.12.1.4 Rare Species

There are 51 rare species (i.e., state rank of S1 or S2 in California or a species of concern by the State of California or USFWS) may occur in the affected area of the Pisgah SEZ (Table 9.3.12.1-1). Of these species, 23 have not been discussed as ESA-listed (Section 9.3.12.1.1), BLM-designated sensitive (Section 9.3.12.1.2), or state-listed (Section 9.3.12.1.3).

9.3.12.2 Impacts

The potential for impacts on special status species from utility-scale solar energy development within the proposed Pisgah SEZ is presented in this section. The types of impacts that special status species could incur from construction and operation of utility-scale solar energy facilities are discussed in Section 5.10.4.

The assessment of impacts on special status species is based on available information on the presence of species in the affected area as presented in Section 9.3.12.1 following the analysis approach described in Appendix M. It is assumed that, prior to development, surveys would be conducted to determine the presence of special status species and their habitats in and near areas where ground-disturbing activities would occur. Additional NEPA assessments, ESA consultations, and coordination with state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid, minimize, or mitigate impacts on special status species (see Section 9.3.12.3).

Solar energy development within the Pisgah SEZ could affect a variety of habitats (see Sections 9.3.9 and 9.3.10). These impacts on habitats could in turn affect special status species that are dependent on those habitats. Based on CNDDB records and information provided by the CDFG and USFWS, there are ten special status species known to occur in the affected area of the Pisgah SEZ: Emory's crucifixion-thorn, small-flowered androstephium, white-margined beardtongue, Arroyo chub, Mohave tui chub, desert tortoise, Mojave fringe-toed lizard, southwestern pond turtle, Bendire's thrasher, and Nelson's bighorn sheep. These species are listed in bold in Table 9.3.12.1-1. No other special status species have been recorded in the affected area (CDFG 2010b). Other special status species may occur on the SEZ or within the affected area based on the presence of potentially suitable habitat. As discussed in Section 9.3.12.1, this approach to identifying the species that could occur in the affected area probably overestimates the number of species that actually occur in the affected area, and may therefore overestimate impacts on some special status species.

Potential direct and indirect impacts on special status species within the SEZ and in the area of indirect effect outside the SEZ are presented in Table 9.3.12.1-1. In addition, the overall potential magnitude of impacts on each species (assuming programmatic design features are in place) is presented along with any potential species-specific mitigation measures that could further reduce impacts.

Impacts on special status species could occur during all phases of development (construction, operation, and decommissioning and reclamation) of a utility-scale solar energy project within the SEZ. Construction and operation activities could result in short- or long-term impacts on individuals and their habitats, especially if these activities are sited in areas where special status species are known to or could occur. As presented in Section 9.3.1.2, impacts of access road and transmission line construction, upgrade, or operation are not assessed in this evaluation due to the proximity of existing infrastructure to the SEZ.

Direct impacts would result from habitat destruction or modification. It is assumed that direct impacts would occur only within the SEZ, where ground-disturbing activities are expected to occur. Indirect impacts could result from surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, accidental spills, harassment, and lighting. No ground-disturbing activities associated with project developments are anticipated to occur within the area of indirect effects. Decommissioning of facilities and reclamation of disturbed areas after operations cease could result in short-term negative impacts on individuals and habitats adjacent to project areas. long-term benefits would accrue if original land contours and native plant communities were restored in previously disturbed areas.

The successful implementation of programmatic design features (discussed in Appendix A, Section A.2.2) would reduce direct impacts on some special status species, especially those that depend on habitat types that can be easily avoided (e.g., dunes and sand transport systems, playa and desert wash habitats). Indirect impacts on special status species could be reduced to negligible levels by implementing programmatic design features, especially those engineering controls that would reduce runoff, sedimentation, spills, and fugitive dust.

9.3.12.2.1 Impacts on Species Listed Under the ESA

Impacts on the two ESA-listed species that may occur in the Pisgah SEZ affected area, or that may be affected by solar energy development on the SEZ, are discussed below.

Mohave Tui Chub

The Mohave tui chub is listed as endangered under the ESA. It is known from only three locations in southern California. One location, a man-made pond at the CDFG's Camp Cady Wildlife Area, is located near the Mojave River approximately 6 mi (10 km) northwest of the Pisgah SEZ. Suitable habitat for this species does not occur on the SEZ or in the affected area, and the nearest potential habitat along the Mojave River and known occurrences within the Camp Cady refugia are outside of the affected area (Figure 9.3.12.1-1). However, the regional groundwater system that supports aquatic habitats within the Mojave River and Camp Cady Wildlife Area is supplemented by additive recharge from the Troy Lake playa in the western portion of the Pisgah SEZ (Stout 2009; see Section 9.3.9.1.2 for further details). Therefore, utilization of groundwater resources from the SEZ for cooling could affect the regional groundwater supply that supports aquatic habitat for the Mohave tui chub.

Groundwater withdrawals to serve the cooling needs of solar development on the Pisgah SEZ could contribute to the depletion of the regional groundwater system, which is already over-depleted, and could affect the habitat for the Mohave tui chub at the Camp Cady Wildlife Area by making it difficult to pump water to maintain this habitat (Stout 2009). However, impacts of groundwater depletion from solar energy development in the Pisgah SEZ cannot be quantified without identification of the cumulative amount of groundwater withdrawals need to support development on the SEZ. Consequently, the overall impact on the Mohave tui chub could range from small to large depending upon the solar energy technology deployed and the scale of development within the SEZ (Table 11.1.12.1-1).

The Mohave tui chub is listed by the CDFG as a California fully protected species. As such, the CDFG has the authority to prohibit direct and indirect impacts on this species under any circumstance. Therefore, the direct and indirect impacts on occupied and suitable habitats at Camp Cady and in the Mojave River should be completely avoided. The implementation of programmatic design features and the avoidance of groundwater withdrawals in the vicinity of the SEZ that would affect habitat quality and availability at Camp Cady and in the Mojave River could reduce impacts on this species to negligible levels. Consultation with the USFWS and CDFG should be required under the ESA and CESA to fully address the impacts of solar development on the Mohave tui chub and to determine any additional mitigation requirements. The strict mitigation measures provided to the Mohave tui chub may also successfully reduce or eliminate impacts on other groundwater-dependent species (e.g., Arroyo chub, southwestern pond turtle).

Desert Tortoise

The desert tortoise is listed as a threatened species under the ESA throughout the entire Pisgah SEZ region. The desert tortoise has the potential to occur within the SEZ on the basis of observed occurrences on and near the SEZ, presence of designated critical habitat within the area of indirect effects, and the presence of apparently suitable habitat in the SEZ (Figure 9.3.12.1-1; Table 9.3.12.1-1). The tortoise is known to occur in the Ord-Rodman DWMA within the area of indirect effects adjacent to the southern boundary of the SEZ; the species is also known to occur in the northern portion of the SEZ near the Cady Mountains (Figure 9.3.12.1-1). According to the CAReGAP habitat suitability model, approximately 16,720 acres (68 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations of solar energy facilities on the SEZ (Table 9.3.12.1-1). This direct effects area represents about 0.4% of available suitable habitat of the desert tortoise in the region. Much of this habitat within the SEZ is considered to be highly suitable (modeled suitability value ≥0.8 out of 1.0) according to the USGS desert tortoise habitat suitability model (Nussear et al. 2009). About 143,604 acres (581 km^2) of suitable habitat occurs in the area of potential indirect effects; this area represents about 3.6% of the available suitable habitat in the region (Table 9.3.12.1-2).

On the basis of desert tortoise surveys conducted in the areas near and overlapping the Pisgah SEZ, the USFWS estimated that full-scale solar energy development on the SEZ may directly affect up to 260 desert tortoises on the SEZ (Stout 2009). In addition to direct impacts, development on the SEZ could indirectly affect desert tortoises by fragmenting and degrading adjacent habitat (refer to Section 5.10.4 for a discussion of possible indirect impacts). Fragmentation would be exacerbated by the installation of exclusionary fencing at the perimeter of the SEZ or individual project areas. The SEZ is situated between the Ord-Rodman and Superior-Cronese DWMAs (these DWMAs also contain USFWS-designated critical habitat), and terrestrial habitats within the SEZ may provide important linkages between the DWMAs. Therefore, development on the SEZ may disrupt desert tortoise population dynamics in nearby DWMAs and designated critical habitat.

The overall impact on the desert tortoise from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the region. The implementation of programmatic design features alone is unlikely to reduce these impacts to negligible levels. Avoidance of all potentially suitable habitats for this species is not a feasible means of mitigating impacts because these habitats (desertscrub) are widespread throughout the area of direct effect.

Development of actions to reduce impacts (e.g., reasonable and prudent alternatives, reasonable and prudent measures, and terms and conditions) for the desert tortoise, including development of a survey protocol, avoidance measures, minimization measures, and, potentially, translocation actions and compensatory mitigation, would require formal consultation with the USFWS under Section 7 of the ESA. These consultations may be used to authorize incidental take statements per Section 10 of the ESA (if necessary). In addition, the CESA provides authority to the CDFG to regulate potential impacts on the desert tortoise and other species listed under the CESA. Therefore, formal consultation with the CDFG would also be required to permit the incidental take of desert tortoises in the SEZ.

There are inherent dangers to tortoises associated with their capture, handling, and translocation from the SEZ. These actions, if done improperly, can result in injury or death. To minimize these risks, and as stated above, the desert tortoise translocation plan should be developed in consultation with the USFWS and CDGF, and follow the *Guidelines for Handling Desert Tortoises During Construction Projects* (Desert Tortoise Council 1994) and other current translocation guidance provided by the USFWS and CDFG. Consultation will identify potentially suitable recipient locations, density thresholds for tortoise populations in recipient locations, procedures for pre-disturbance clearance surveys and tortoise handling, as well as disease testing and post-translocation monitoring and reporting requirements. Despite some risk of mortality or decreased fitness, translocation is widely accepted as a useful strategy for the conservation of the desert tortoise (Field et al. 2007).

To offset impacts of solar development on the SEZ, compensatory mitigation may be needed to balance the acreage of habitat lost with acquisition of lands that would be improved and protected for desert tortoise populations (USFWS 1994). Compensation can be accomplished by improving the carrying capacity for the desert tortoise on the acquired lands. Other mitigation actions may include funding for the habitat enhancement of the desert tortoise on existing federal lands. Consultations with the USFWS and CDGF would be necessary to determine the appropriate mitigation ratio to acquire, enhance, and preserve desert tortoise compensation lands.

9.3.12.2.2 Impacts on BLM-Designated Sensitive Species

Impacts on the 28 BLM-designated sensitive species that have potentially suitable habitat within the SEZ and are not previously discussed as ESA-listed (Section 9.3.12.2.1) are discussed below.

Alkali Mariposa-Lily

The alkali mariposa-lily is not known to occur in the affected area of the Pisgah SEZ; however, according to the CAReGAP land cover model, approximately 2,795 acres (11 km^2) of potentially suitable desert playa habitat on the SEZ could be directly affected by construction and operations (Table 9.3.12.1-1). This direct impact area represents about 2.6% of available suitable habitat in the region. About 4,767 acres (19 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 4.4% of the available suitable habitat in the region (Table 9.3.12.1-1).

The overall impact on the alkali mariposa-lily from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered moderate because the amount of potentially suitable habitat for this species in the area of direct effects represents greater than 1% but less than 10% of potentially suitable habitat in the region. The implementation of programmatic design features would reduce indirect impacts to negligible levels.

Potentially suitable habitat for the alkali mariposa-lily occurs in a limited portion of the SEZ (primarily associated with Troy Lake) and could be completely avoided during the development of facilities and protected from indirect effects. Alternatively, avoiding or minimizing disturbance to occupied habitats also would reduce impacts on this species. If avoidance or minimization are not feasible options, plants could be translocated from the area of direct effects to protected areas that would not be affected directly or indirectly by future development. Alternatively, or in combination with translocation, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or more of these options could be designed to completely offset the impacts of development. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Barstow Woolly Sunflower

The Barstow woolly sunflower is not known to occur in the affected area of the Pisgah SEZ; however, according to the CAReGAP land cover model, approximately 18,466 acres (75 km^2) of potentially suitable desertscrub and playa habitat on the SEZ could be directly affected by construction and operations (Table 9.3.12.1-1). This direct impact area represents about 0.7% of available suitable habitat in the region. About 111,523 acres (451 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 4.2% of the available suitable habitat in the region (Table 9.3.12.1-1).

The overall impact on the Barstow woolly sunflower from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features are expected to reduce indirect impacts to negligible levels.

The avoidance of all potentially suitable habitats is not a feasible way to mitigate impacts on the Barstow woolly sunflower because these habitats (mostly desert scrub) are widespread throughout the area of direct effects. However, impacts could be reduced to negligible levels with the implementation of programmatic design features and the mitigation options described previously for the alkali mariposa-lily. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Chaparral Sand-Verbena

The chaparral sand-verbena historically occurred as near as 30 mi (48 km) west of the SEZ, but it is currently only known to occur in Orange and Riverside Counties, California, outside of the area of indirect effects. According to the CAReGAP land cover model, approximately 322 acres (1 km^2) of potentially suitable desert sand dune habitat within the SEZ may be directly affected by project construction and operations (Table 9.3.12.1-1). This direct impact area represents 0.2% of available suitable habitat in the region. About 5,155 acres (21 km^2) of potentially suitable habitat occurs within the area of indirect effects; this area represents about 3.2% of the available suitable habitat in the region (Table 9.3.12.1-1).

The overall impact on the chaparral sand-verbena from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features would reduce indirect impacts to negligible levels.

Chaparral sand-verbena habitat (desert sand dunes) occupies a limited portion of the SEZ and could be avoided during the development of facilities and protected from indirect effects. In conjunction with the implementation of programmatic design features, avoiding or minimizing disturbance of occupied habitats and desert dunes and sand transport systems, and the mitigation measures described previously for the alkali mariposa-lily, could further reduce impacts on this species. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Clokey’s Cryptantha

The Clokey’s cryptantha is not known to occur in the affected area of the Pisgah SEZ; however, according to the CAReGAP land cover model, approximately 15,427 acres (62 km^2) of potentially suitable desertscrub and playa habitat on the SEZ could be directly affected by construction and operations (Table 9.3.12.1-1). This direct impact area represents about 0.5% of available suitable habitat in the region. About 107,664 acres (436 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 3.7% of the available suitable habitat in the region (Table 9.3.12.1-1).

The overall impact on the Clokey’s cryptantha from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the region. The implementation of programmatic design features would reduce indirect impacts to negligible levels.

Avoidance of all potentially suitable habitats is not a feasible way to mitigate impacts on the Clokey’s cryptantha because some of these habitats (desertscrub) are widespread throughout the area of direct effect. However, impacts could be reduced to negligible levels with the implementation of programmatic design features and the mitigation options described previously for the alkali mariposa-lily. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Coulter's Goldfields

The Coulter's goldfields is not known to occur in the affected area of the Pisgah SEZ; however, according to the CAReGAP land cover model, approximately 2,795 acres (11 km^2) of potentially suitable desert playa habitat on the SEZ could be directly affected by construction and operations (Table 9.3.12.1-1). This direct impact area represents about 2.6% of available suitable habitat in the region. About 4,767 acres (19 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 4.4% of the available suitable habitat in the region (Table 9.3.12.1-1).

The overall impact on the Coulter's goldfields from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered moderate because the amount of potentially suitable habitat for this species in the area of direct effects represents greater than 1% but less than 10% of potentially suitable habitat in the region. The implementation of programmatic design features would reduce indirect impacts to negligible levels.

Potentially suitable habitat for the Coulter's goldfields (desert playa) occurs in a limited portion of the SEZ in association with Troy Lake near the western portion of the SEZ and could be avoided during the development of facilities and protected from indirect effects. In conjunction with the implementation of programmatic design features, avoiding or minimizing disturbance to occupied habitats and desert playa habitats, and the mitigation measures described previously for the alkali mariposa-lily, could further reduce impacts on this species. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Creamy Blazing-Star

The creamy blazing-star is not known to occur in the affected area of the Pisgah SEZ; however, according to the CAReGAP land cover model, approximately 14,548 acres (59 km^2) of potentially suitable desertscrub habitat on the SEZ could be directly affected by construction and operations (Table 9.3.12.1-1). This direct impact area represents about 0.6% of available suitable habitat in the region. About 101,079 acres (409 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 4.4% of the available suitable habitat in the SEZ region (Table 9.3.12.1-1).

The overall impact on the creamy blazing-star from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features would reduce indirect impacts to negligible levels.

Avoidance of all potentially suitable habitats is not a feasible way to mitigate impacts on the creamy blazing-star because some of these habitats (desertscrub) are widespread throughout the area of direct effect. However, impacts could be reduced to negligible levels with the implementation of programmatic design features and the mitigation options described previously for the alkali mariposa-lily. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Desert Cymopterus

The desert cymopterus is not known to occur in the affected area of the Pisgah SEZ; however, according to the CAReGAP land cover model, approximately 244 acres (1 km^2) of potentially suitable desert wash habitat on the SEZ could be directly affected by construction and operations (Table 9.3.12.1-1). This direct impact area represents about 0.3% of available suitable habitat in the region. About 1,907 acres (8 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 2.3% of the available suitable habitat in the region (Table 9.3.12.1-1).

The overall impact on the desert cymopterus from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features would reduce indirect impacts to negligible levels.

Potentially suitable habitat of the desert cymopterus (desert wash) occurs on a limited portion of the SEZ and could be avoided during the development of facilities and protected from indirect effects. In conjunction with the implementation of programmatic design features, avoiding or minimizing disturbance of occupied habitats and desert wash habitats, and the mitigation measures described previously for the alkali mariposa-lily, could further reduce impacts on this species. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Flat-Seeded Spurge

The flat-seeded spurge is not known to occur in the affected area of the Pisgah SEZ; however, according to the CAReGAP land cover model, approximately 322 acres (1 km^2) of potentially suitable desert sand dune habitat within the SEZ may be directly affected by project construction and operations (Table 9.3.12.1-1). This direct impact area represents 0.2% of available suitable habitat in the region. About 5,155 acres (21 km^2) of potentially suitable habitat occurs within the area of indirect effects; this area represents about 3.2% of the available suitable habitat in the region (Table 9.3.12.1-1).

The overall impact on the flat-seeded spurge from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features would reduce indirect impacts to negligible levels.

Flat-seeded spurge habitat (desert sand dunes) occupies a limited portion of the SEZ and could be avoided during the development of facilities and protected from indirect effects. In conjunction with the implementation of programmatic design features, avoiding or minimizing disturbance of occupied habitats and desert dunes and sand transport systems, in addition to the mitigation measures described previously for the alkali mariposa-lily, could further reduce impacts on this species; however, translocation may not be a feasible mitigation option for this species. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Harwood's Eriastrum

The Harwood's eriastrum is not known to occur in the affected area of the Pisgah SEZ; however, according to the CAReGAP land cover model, approximately 322 acres (1 km^2) of potentially suitable desert dune habitat on the SEZ could be directly affected by construction and operations (Table 9.3.12.1-1). This direct impact area represents about 0.2% of available suitable habitat in the region. About 5,155 acres (21 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 3.5% of the available suitable habitat in the SEZ region (Table 9.3.12.1-1).

The overall impact on the Harwood's eriastrum from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features would reduce indirect impacts to negligible levels.

Potentially suitable habitat for the Harwood's eriastrum (desert sand dunes) occurs on a limited portion of the SEZ and could be avoided during the development of facilities and protected from indirect effects. In conjunction with the implementation of programmatic design features, avoiding or minimizing disturbance to occupied habitats and desert dunes and sand transport systems, and the mitigation measures described previously for the alkali mariposa-lily, could further reduce impacts on this species. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Latimer's Woodland-Gilia

The Latimer's woodland-gilia is not known to occur in the affected area of the Pisgah SEZ; however, according to the CAReGAP land cover model, approximately 15,671 acres (63 km^2) of potentially suitable desertscrub and wash habitat on the SEZ could be directly affected by construction and operations (Table 9.3.12.1-1). This direct impact area represents about 0.5% of available suitable habitat in the region. About 109,571 acres (443 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 3.7% of the available suitable habitat in the region (Table 9.3.12.1-1).

The overall impact on the Latimer's woodland gilia from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features would reduce indirect impacts to negligible levels.

Avoidance of all potentially suitable habitats is not a feasible way to mitigate impacts on the Latimer's woodland gilia because some of these habitats (desertscrub) are widespread throughout the area of direct effect. However, impacts could be reduced to negligible levels with the implementation of mitigation options described previously for the alkali mariposa-lily. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Limestone Beardtongue

The limestone beardtongue is not known to occur in the affected area of the Pisgah SEZ; however, according to the CAReGAP land cover model, approximately 15,427 acres (62 km^2) of potentially suitable desertscrub habitat on the SEZ could be directly affected by construction and operations (Table 9.3.12.1-1). This direct impact area represents about 0.5% of available suitable habitat in the SEZ region. About 107,664 acres (436 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 3.7% of the available suitable habitat in the region (Table 9.3.12.1-1).

The overall impact on the limestone beardtongue from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features would reduce indirect impacts to negligible levels.

Avoidance of all potentially suitable habitats is not a feasible way to mitigate impacts on the limestone beardtongue because some of these habitats (desertscrub) are widespread throughout the area of direct effect. However, impacts could be reduced to negligible levels with the implementation of mitigation options described previously for the alkali mariposa-lily. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Little San Bernardino Mountains Linanthus

The Little San Bernardino Mountains linanthus is not known to occur in the affected area of the Pisgah SEZ; however, according to the CAReGAP land cover model, approximately 322 acres (1 km^2) of potentially suitable desert dune habitat on the SEZ could be directly affected by construction and operations (Table 9.3.12.1-1). This direct impact area represents about 0.2% of available suitable habitat in the SEZ region. About 5,155 acres (21 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 3.5% of the available suitable habitat in the SEZ region (Table 9.3.12.1-1).

The overall impact on the Little San Bernardino Mountains linanthus from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features would reduce indirect impacts to negligible levels.

Potentially suitable habitat of the Little San Bernardino Mountains linanthus (desert sand dunes) occurs in a limited portion of the SEZ and could be avoided during the development of facilities and protected from indirect effects. In conjunction with the implementation of programmatic design features, avoiding or minimizing disturbance to occupied habitats and desert dunes and sand transport systems, and the mitigation measures described previously for the alkali mariposa-lily, could further reduce impacts on this species. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Mojave Monkeyflower

The Mojave monkeyflower is not known to occur in the affected area of the Pisgah SEZ; however, according to the CAReGAP land cover model, approximately 244 acres (1 km^2) of potentially suitable desert wash habitat on the SEZ could be directly affected by construction and operations (Table 9.3.12.1-1). This direct impact area represents about 0.3% of available suitable habitat in the region. About 1,907 acres (8 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 2.3% of the available suitable habitat in the SEZ region (Table 9.3.12.1-1).

The overall impact on the Mojave monkeyflower from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features would reduce indirect impacts to negligible levels.

Potentially suitable habitat of the Mojave monkeyflower (desert wash) occurs on a limited portion of the SEZ and could be avoided during the development of facilities and protected from indirect effects. In conjunction with the implementation of programmatic design features, avoiding or minimizing disturbance to occupied habitats and all desert wash habitats, and the mitigation measures described previously for the alkali mariposa-lily, could further reduce impacts on this species. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Palmer's Mariposa-Lily

The Palmer's mariposa-lily is not known to occur in the affected area of the Pisgah SEZ. Direct impacts on this species are not expected to occur because there is no suitable riparian habitat for this species on the SEZ. However, according to the CAReGAP land cover model, approximately 68 acres (<1 km^2) of potentially suitable riparian habitat occurs in the area of potential indirect effect; this area represents about 0.6% of the available suitable habitat in the SEZ region (Table 9.3.12.1-1).

The overall impact on the Palmer's mariposa-lily from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered small because no suitable habitat occurs on the SEZ and only indirect effects are possible. The implementation of programmatic design features would reduce indirect impacts to negligible levels. No species-specific mitigation for the Palmer's mariposa-lily is feasible or warranted.

Parish's Brittlescale

The Parish's brittlescale is not known to occur in the affected area of the Pisgah SEZ; however, according to the CAReGAP land cover model, approximately 3,918 acres (16 km^2) of potentially suitable desert playa and wash habitat on the SEZ could be directly affected by construction and operations (Table 9.3.12.1-1). This direct impact area represents about 1.0% of available suitable habitat in the region. About 10,444 acres (42 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 2.8% of the available suitable habitat in the SEZ region (Table 9.3.12.1-1).

The overall impact on the Parish's brittlescale from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered moderate because the amount of potentially suitable habitat for this species in the area of direct effects represents greater than 1% but less than 10% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features would reduce indirect impacts to negligible levels.

Parish's brittlescale habitat (desert playa and wash) occupies a limited portion of the SEZ and could be avoided during the development of facilities and protected from indirect effects. In conjunction with the implementation of programmatic design features, avoiding or minimizing disturbance to occupied habitats and all desert playa and wash habitats, and the mitigation measures described previously for the alkali mariposa-lily, could further reduce impacts on this species. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Parish's Phacelia

The Parish's phacelia is not known to occur in the affected area of the Pisgah SEZ; however, according to the CAReGAP land cover model, approximately 18,222 acres (74 km^2) of potentially suitable desertscrub and playa habitat on the SEZ could be directly affected by construction and operations (Table 9.3.12.1-1). This direct impact area represents about 0.6% of available suitable habitat in the region. About 112,431 acres (455 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 3.8% of the available suitable habitat in the SEZ region (Table 9.3.12.1-1).

The overall impact on the Parish's phacelia from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features would reduce indirect impacts to negligible levels.

Avoidance of all potentially suitable habitats is not a feasible way to mitigate impacts on the Parish's phacelia because some of these habitats (desertscrub) are widespread throughout the area of direct effect. However, impacts could be reduced to negligible levels with the implementation of mitigation options described previously for the alkali mariposa-lily. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Stephen's Beardtongue

The Stephen's beardtongue is not known to occur in the affected area of the Pisgah SEZ; however, according to the CAReGAP land cover model, approximately 16,297 acres (66 km^2) of potentially suitable desertscrub and wash habitat on the SEZ could be directly affected by construction and operations (Table 9.3.12.1-1). This direct impact area represents about 0.4% of available suitable habitat in the region. About 144,048 acres (583 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 3.9% of the available suitable habitat in the SEZ region (Table 9.3.12.1-1).

The overall impact on the Stephen's beardtongue from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features would reduce indirect impacts to negligible levels.

Avoidance of all potentially suitable habitats is not a feasible way to mitigate impacts on the Stephen's beardtongue because some of these habitats (desertscrub) are widespread throughout the area of direct effect. However, impacts could be reduced to negligible levels with the implementation of programmatic design features and the mitigation options described previously for the alkali mariposa-lily. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

White-Bracted Spineflower

The white-bracted spineflower is not known to occur in the affected area of the Pisgah SEZ; however, according to the CAReGAP land cover model, approximately 15,427 acres (62 km^2) of potentially suitable desertscrub habitat on the SEZ could be directly affected by construction and operations (Table 9.3.12.1-1). This direct impact area represents about 0.5% of available suitable habitat in the SEZ region. About 107,664 acres (436 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 3.7% of the available suitable habitat in the SEZ region (Table 9.3.12.1-1).

The overall impact on the white-bracted spineflower from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features would reduce indirect impacts to negligible levels.

Avoidance of all potentially suitable habitats is not feasible to mitigate impacts on the white-bracted spineflower because some of these habitats (desertscrub) are widespread throughout the area of direct effect. However, impacts could be reduced to negligible levels with the implementation of programmatic design features and the mitigation options described previously for the alkali mariposa-lily. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

White-Margined Beardtongue

The white-margined beardtongue is known to occur on the Pisgah SEZ and in other portions of the affected area. According to the CAReGAP land cover model, approximately 15,749 acres (64 km^2) of potentially suitable desertscrub and dune habitat on the SEZ could be directly affected by construction and operations (Table 9.3.12.1-1). This direct impact area represents about 0.5% of available suitable habitat in the SEZ region. About 112,819 acres

(457 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 3.7% of the available suitable habitat in the SEZ region (Table 9.3.12.1-1).

The overall impact on the white-margined beardtongue from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features would reduce indirect impacts to negligible levels.

Avoidance of all potentially suitable habitats is not a feasible way to mitigate impacts on the white-margined beardtongue because some of these habitats (desertscrub) are widespread throughout the area of direct effect. However, impacts could be reduced to negligible levels with the implementation of programmatic design features and the mitigation options described previously for the alkali mariposa-lily. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Mojave Fringe-Toed Lizard

The Mojave fringe-toed lizard is known to occur on the Pisgah SEZ and in other portions of the affected area. According to the CAReGAP habitat suitability model, approximately 19,218 acres (78 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 9.3.12.1-1). This direct impact area represents about 0.5% of available suitable habitat in the SEZ region. About 156,798 acres (635 km^2) of potentially suitable foraging habitat occurs in the area of potential indirect effect; this area represents about 4.1% of the available suitable habitat in the SEZ region (Table 9.3.12.1-1).

The overall impact on the Mojave fringe-toed lizard from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the region. The implementation of programmatic design features would reduce indirect impacts to negligible levels.

Avoidance of all potentially suitable habitats is not a feasible way to mitigate impacts on the Mojave fringe-toed lizard because, according to the CAReGAP habitat suitability model, these habitats are widespread throughout the area of direct effect. However, avoiding or minimizing disturbance to occupied habitats, dune and sand transport systems, and desert wash habitats could reduce impacts on this species. If avoiding or minimizing is not a feasible option, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that uses one or both of these options could be designed to completely offset the impacts of development. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Bendire's Thrasher

The Bendire's thrasher is a summer resident in southern California and is known to occur on the Pisgah SEZ and in other portions of the affected area. According to the CAReGAP land cover model, approximately 15,427 acres (62 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations of solar energy development (Table 9.3.12.1-1). This direct effects area represents about 0.5% of available suitable habitat in the SEZ region. About 107,664 acres (436 km^2) of suitable habitat occurs in the area of potential indirect effects; this area represents about 3.7% of the available suitable habitat in the SEZ region (Table 9.3.12.1-1).

The overall impact on the Bendire's thrasher from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features are expected to reduce indirect impacts to negligible levels.

Avoidance of all potentially suitable habitats is not feasible to mitigate impacts on the Bendire's thrasher because potentially suitable desertscrub habitats are widespread throughout the area of direct effect. Impacts could be reduced to negligible levels through the implementation of programmatic design features and by conducting pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats on the SEZ, especially nesting habitats. If avoidance or minimization is not a feasible option, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or both of these options could be designed to completely offset the impacts of development. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Ferruginous Hawk

The ferruginous hawk is a winter resident in southern California within the Pisgah SEZ region. According to the CAReGAP land cover model, approximately 15,598 acres (63 km^2) of potentially suitable foraging habitat on the SEZ could be directly affected by construction and operations (Table 9.3.12.1-1). This direct impact area represents about 0.5% of available suitable habitat in the SEZ region. About 110,385 acres (447 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 3.7% of the available suitable habitat in the SEZ region (Table 9.3.12.1-1).

The overall impact on the ferruginous hawk from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered small because direct effects would only occur on potentially suitable foraging habitat, and the amount of this habitat in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features are expected to reduce indirect impacts to negligible levels. Avoidance of direct impacts on all potentially suitable foraging habitat is not a feasible way to mitigate impacts on the ferruginous hawk because potentially suitable shrubland is widespread throughout the area of direct effects and readily available in other portions of the affected area.

Western Burrowing Owl

The western burrowing owl is not known to occur in the affected area of the Pisgah SEZ. However, according to the CAReGAP habitat suitability model, approximately 23,932 acres (97 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 9.3.12.1-1). This direct impact area represents 0.5% of available suitable habitat in the SEZ region. About 180,886 acres (732 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 3.7% of the available suitable habitat in the SEZ region (Table 9.3.12.1-1). Most of this area could serve as foraging and nesting habitat (shrublands). The abundance of burrows suitable for nesting on the SEZ and in the area of indirect effects has not been determined.

The overall impact on the western burrowing owl from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels.

Avoidance of all potentially suitable habitats is not feasible to mitigate impacts on the ferruginous hawk because potentially suitable desertscrub habitats are widespread throughout the area of direct effect. However, impacts on the western burrowing owl could be reduced by avoiding or minimizing disturbance to occupied burrows and habitat in the area of direct effects. If avoidance or minimization of disturbance to all occupied habitat is not a feasible option, a compensatory mitigation plan could be developed and implemented to mitigate direct effects. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or both of these options could be designed to completely offset the impacts of development. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Mojave Ground Squirrel

The Mohave ground squirrel is not known to occur in the affected area of the Pisgah SEZ. However, the species is known to occur about 15 mi (24 km) west of the SEZ and, according to the CAReGAP land cover model, approximately 15,427 acres (62 km^2) of potentially suitable desertscrub habitat on the SEZ could be directly affected by construction and operations (Table 9.3.12.1-1). This direct impact area represents about 0.5% of available suitable foraging habitat in the SEZ region. About 107,664 acres (436 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 3.7% of the available suitable habitat in the SEZ region (Table 9.3.12.1-1).

The overall impact on the Mohave ground squirrel from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels.

Avoidance of all potentially suitable habitats is not a feasible way to mitigate impacts on the Mohave ground squirrel because potentially suitable desertscrub habitats are widespread throughout the area of direct effect. Impacts could be reduced to negligible levels through the implementation of programmatic design features and by avoiding or minimizing disturbance to occupied habitats on the SEZ. If avoidance or minimization is not a feasible option, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or both of these options could be designed to completely offset the impacts of development. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Nelson's Bighorn Sheep

The Nelson's bighorn sheep (also called the desert bighorn sheep) is known to occur in the affected area from the Cady Mountains within 5 mi (8 km) northeast of the Pisgah SEZ. The species is also known to occur in the Rodman Mountains outside of the affected area, approximately 10 mi (16 km) west of the SEZ. Sheep may utilize habitats within the SEZ as migration corridors between these ranges. According to the CAReGAP habitat suitability model, approximately 20,578 acres (83 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 9.3.12.1-1). This direct impact area represents about 1.1% of available suitable habitat in the SEZ region. About 126,778 acres (513 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 6.9% of the available suitable habitat in the SEZ region (Table 9.3.12.1-1).

The overall impact on the Nelson's bighorn sheep from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered moderate because the amount of potentially suitable habitat for this species in the area of direct effects represents greater than 1% but less than 10% of potentially suitable habitat in the region, and the implementation of programmatic design features alone is unlikely to substantially reduce impacts.

Impacts on the Nelson's bighorn sheep could be reduced to small or negligible levels by avoiding or minimizing disturbance of occupied habitats and important movement corridors on the SEZ. If avoidance or minimization are not a feasible options, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or both of these options could be designed to completely offset the impacts of development. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Pallid Bat

The pallid bat is a year-round resident in southern California within the Pisgah SEZ region. According to the CAReGAP land cover model, approximately 16,932 acres (69 km^2) of potentially suitable foraging habitat on the SEZ could be directly affected by construction and operations (Table 9.3.12.1-1). This direct impact area represents about 0.4% of available suitable foraging habitat in the SEZ region. About 148,804 acres (602 km^2) of potentially suitable foraging habitat occurs in the area of potential indirect effect; this area represents about 3.5% of the available suitable foraging habitat in the SEZ region (Table 9.3.12.1-1). The potentially suitable habitat on the SEZ is primarily foraging habitat (desert shrubland); however, suitable roosting habitat may occur on the SEZ. On the basis of an evaluation of land cover types, approximately 1,500 acres (6 km^2) of rocky cliffs and outcrops that may be potentially suitable roosting habitat occurs on the SEZ. An additional 41,000 acres (166 km^2) of rocky cliffs and outcrops occurs in the area of direct effects.

The overall impact on the pallid bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features are expected to reduce indirect impacts to negligible levels.

Avoidance of direct impacts on all foraging habitat (shrublands) is not feasible because suitable foraging habitat (shrublands) is widespread in the area of direct effect and readily available in other portions of the affected area. However, avoiding or minimizing disturbance of all potential roosting habitat (rocky cliffs and outcrops) on the SEZ is feasible, and could reduce impacts. If avoidance or minimization of disturbance to all occupied or suitable roosting habitat is not a feasible option, a compensatory mitigation plan could be developed and implemented to mitigate direct effects. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or both of these options could be designed to completely offset the impacts of development. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat within the area of direct effects.

Spotted Bat

The spotted bat is considered to be a rare year-round resident in southern California within the Pisgah SEZ region. According to the CAReGAP land cover model, approximately 15,427 acres (62 km^2) of potentially suitable foraging habitat on the SEZ could be directly affected by construction and operations (Table 9.3.12.1-1). This direct impact area represents about 0.5% of available suitable foraging habitat in the SEZ region. About 107,732 acres (436 km^2) of potentially suitable foraging habitat occurs in the area of potential indirect effect; this area represents about 3.7% of the available suitable foraging habitat in the SEZ region (Table 9.3.12.1-1). The potentially suitable habitat on the SEZ is primarily foraging habitat (desert shrubland); however, suitable roosting habitat may occur on the SEZ. On the basis of an evaluation of land cover types, approximately 1,500 acres (6 km^2) of rocky cliffs and outcrops that may be potentially suitable roosting habitat occurs on the SEZ. An additional 41,000 acres (166 km^2) of rocky cliffs and outcrops occurs in the area of direct effects.

The overall impact on the spotted bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features are expected to reduce indirect impacts to negligible levels.

Avoidance of direct impacts on all foraging habitat (shrublands) is not feasible because suitable foraging habitat (shrublands) is widespread in the area of direct effect and readily available in other portions of the affected area. However, avoiding or minimizing disturbance of all potential roosting habitat (rocky cliffs and outcrops) on the SEZ is feasible, and could reduce impacts. If avoidance or minimization of disturbance to all occupied or suitable roosting habitat is not a feasible option, a compensatory mitigation plan could be developed and implemented to mitigate direct effects. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or both of these options could be designed to completely offset the impacts of development. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat within the area of direct effects.

Townsend's Big-Eared Bat

The Townsend's big-eared bat is a year-round resident in southern California within the Pisgah SEZ region. According to the CAReGAP land cover model, approximately 23,950 acres (97 km^2) of potentially suitable foraging habitat on the SEZ could be directly affected by construction and operations (Table 9.3.12.1-1). This direct impact area represents about 0.5% of available suitable foraging habitat in the SEZ region. About 181,086 acres (733 km^2) of potentially suitable foraging habitat occurs in the area of potential indirect effect; this area represents about 3.8% of the available suitable foraging habitat in the SEZ region (Table 9.3.12.1-1). The potentially suitable habitat on the SEZ is primarily foraging habitat (desert shrubland); however, suitable roosting habitat may occur on the SEZ. On the basis of an evaluation of land cover types, approximately 1,500 acres (6 km^2) of rocky cliffs and outcrops that may be potentially suitable roosting habitat occurs on the SEZ. An additional 41,000 acres (166 km^2) of rocky cliffs and outcrops occurs in the area of direct effects.

The overall impact on the Townsend's big-eared bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features are expected to reduce indirect impacts to negligible levels.

Avoidance of direct impacts on all foraging habitat (shrublands) is not feasible because suitable foraging habitat (shrublands) is widespread in the area of direct effect and readily available in other portions of the affected area. However, avoiding or minimizing disturbance of all potential roosting habitat (rocky cliffs and outcrops) on the SEZ is feasible, and could reduce impacts. If avoidance or minimization of disturbance to all occupied or suitable roosting habitat is not a feasible option, a compensatory mitigation plan could be developed and implemented to mitigate direct effects. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or both of these options could be designed to completely offset the impacts of development. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat within the area of direct effects.

Western Mastiff Bat

The western mastiff bat is a year-round resident in southern California within the Pisgah SEZ region. According to the CAReGAP land cover model, approximately 23,950 acres (97 km^2) of potentially suitable foraging habitat on the SEZ could be directly affected by construction and operations (Table 9.3.12.1-1). This direct impact area represents about 0.5% of available suitable foraging habitat in the SEZ region. About 181,086 acres (733 km^2) of potentially suitable foraging habitat occurs in the area of potential indirect effect; this area represents about 3.8% of the available suitable foraging habitat in the SEZ region (Table 9.3.12.1-1). The potentially suitable habitat on the SEZ is primarily foraging habitat (desert shrubland); however, suitable roosting habitat may occur on the SEZ. On the basis of an evaluation of land cover types, approximately 1,500 acres (6 km^2) of rocky cliffs and outcrops that may be potentially suitable roosting habitat occurs on the SEZ. An additional 41,000 acres (166 km^2) of rocky cliffs and outcrops occurs in the area of direct effects.

The overall impact on the western mastiff bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the Pisgah SEZ is considered small because the amount of potentially suitable habitat for this species in the area of direct effects represents less than 1% of potentially suitable habitat in the region. The implementation of programmatic design features are expected to reduce indirect impacts to negligible levels.

Avoidance of direct impacts on all foraging habitat (shrublands) is not feasible because suitable foraging habitat (shrublands) is widespread in the area of direct effect and readily available in other portions of the affected area. However, avoiding or minimizing disturbance of all potential roosting habitat (rocky cliffs and outcrops) on the SEZ is feasible, and could reduce impacts. If avoidance or minimization of disturbance to all occupied or suitable roosting habitat is not a feasible option, a compensatory mitigation plan could be developed and implemented to mitigate direct effects. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or both of these options could be designed to completely offset the impacts of development. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat within the area of direct effects.

9.3.12.2.3 Impacts on State-Listed Species

There are three species listed by the State of California that could occur in the affected area of the Pisgah SEZ (Section 9.3.12.1.4; Table 9.3.12.1-1): Mojave tui chub, desert tortoise, and Mohave ground squirrel. Potential impacts on each of these species is discussed in Section 9.3.12.2.1 or 9.3.12.2.2 because of their status under the ESA or BLM.

9.3.12.2.4 Impacts on Rare Species

There are 51 species with a state rank of S1 or S2 in California or considered a species of concern by the State of California or the USFWS may occur in the affected area of the Pisgah SEZ. Impacts have been previously discussed for 28 of these species that are also listed under the ESA (Section 9.3.12.2.1), BLM-designated sensitive (Section 9.3.12.2.2), or state-listed (Section 9.3.12.2.3). Impacts on the remaining 23 rare species that do not have any other special status designation are presented in Table 9.3.12.1-1.

9.3.12.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A would greatly reduce or eliminate the potential for effects of utility-scale solar energy development on special status species. While some SEZ-specific mitigation measures are best established when specific project details are being considered, some design features can be identified at this time, including the following:

- Pre-disturbance surveys should be conducted within the SEZ to determine the presence and abundance of all special status species, including those identified in Table 9.3.12.1-1; disturbance of occupied habitats for these species should be avoided or minimized to the extent practicable. If avoiding or minimizing impacts on occupied habitats is not possible, translocation of individuals from areas of direct effect, or compensatory mitigation of direct effects on occupied habitats could reduce impacts. A comprehensive mitigation strategy for special status species that used one or more of these options to offset the impacts of development should be developed in coordination with the appropriate federal and state agencies.

- Disturbance of desert playa and wash habitats within the SEZ should be avoided or minimized to the extent practicable. In particular, development should be avoided in and near Troy Lake in the western portion of the SEZ. Adverse impacts on the following species could be reduced with the avoidance of Troy Lake and desert wash habitats on the SEZ: alkali mariposa-lily, black bog-rush, California saw-grass, Coulter's goldfields, Darwin rock-cress, desert cymopterus, jackass-clover, Mojave monkeyflower, Parish's brittlescale, Utah glasswort, and Mojave fringe-tailed lizard.

- Avoidance or minimization of disturbance to desert dunes and sand transport systems on the SEZ could reduce impacts on the following special status species: chaparral sand-verbena, flat-seeded spurge, Harwood's eriastrum, jackass-clover, Little San Bernardino Mountains linanthus, and Mojave fringe-toed lizard.

- Avoidance or minimization of disturbance to rocky cliff and outcrop habitats on the SEZ could reduce impacts on the Nelson's bighorn sheep, pallid bat (roosting), spotted bat (roosting),Townsend's big-eared bat (roosting), and western mastiff bat (roosting).

- Avoidance of groundwater withdrawals from the SEZ would reduce or prevent impacts on the following special status species that may occur in aquatic habitats outside of the affected area: Arroyo chub, Mojave tui chub, and southwestern pond turtle.

- As California fully protected species, direct and indirect impacts on the Mohave tui chub should be completely avoided. This includes the avoidance of groundwater withdrawals from the SEZ that may affect habitats at Camp Cady and in the Mojave River. Coordination with the CDFG should be conducted for the Mohave tui chub to address the potential for impact when project-related groundwater demands are better identified.

- Consultations with the USFWS and the CDFG should be conducted to address the potential for impacts on the Mojave tui chub and desert tortoise species listed as endangered and threatened, respectively, under the ESA and CESA. Consultation would identify an appropriate survey protocol, avoidance measures, and, if appropriate, reasonable and prudent alternatives, reasonable and prudent measures, and terms and conditions for incidental take statements.

- Harassment or disturbance of special status species and their habitats in the affected area should be mitigated. This can be accomplished by identifying any additional sensitive areas and implementing necessary protection measures based upon consultation with the USFWS and CDFG.

If these SEZ-specific design features are implemented in addition to required programmatic design features, impacts on the special status and rare species would be reduced.

9.3.13 Air Quality and Climate

9.3.13.1 Affected Environment

9.3.13.1.1 Climate

The proposed Pisgah SEZ is located in the central portion of San Bernardino County in southeastern California. The SEZ with an average elevation of 1,980 ft (604 m) lies in the western portion of the Mojave Desert, which has an extremely arid climate marked by mild winters and hot summers, large daily temperature swings, scant precipitation, high evaporation rates, low relative humidity, and abundant sunshine. Meteorological data collected at the Barstow-Daggett Airport, which is about 12 mi (19 km) west of the Pisgah SEZ, are summarized below.

A wind rose from the Barstow-Daggett Airport in Daggett, California, for the 5-year period 2003 to 2005 and for 2007 to 2008 and taken at a level of 33 ft (10 m), is presented in Figure 9.3.13.1-1 (NCDC 2010a). During this period, the annual average wind speed at the airport was about 10.9 mph (4.9 m/s), with a predominant wind direction from the west (about 28% of the time) and secondarily from the west–southwest (about 19% of the time). Predominance of west wind components (about 72% in wind directions ranging from southwest to northwest inclusive) is reflective of the statewide prevailing westerlies (NCDC 2010b), because the airport is located far from topographic features and not affected by local terrain. Winds blew predominantly from the west every month throughout the year. Wind speeds categorized as calm (less than 1.1 mph [0.5 m/s]) occurred frequently (almost 9% of the time) because of the stable conditions caused by strong radiative cooling from late night to sunrise. Average wind speeds by season were the highest in spring at 13.7 mph (6.1 m/s); lower in summer and fall at 12.2 mph (5.4 m/s) and 9.5 mph (4.2 m/s), respectively; and lowest in winter at 8.4 mph (3.8 m/s).

For the 1948 to 2009 period, the annual average temperature at Barstow-Daggett Airport was 67.5°F (19.7°C) (WRCC 2010b). December was the coldest month with an average minimum temperature of 35.6°F (2.0°C), and July was the warmest month with an average maximum of 104.3°F (40.2°C). On most days in summer, daytime maximum temperatures were in the 100s, and minimums were in the upper 60s or higher. In winter, the minimum temperatures recorded were below freezing (≤32°F [0°C]) on about 10 days of each of the colder months (January and December), but subzero temperatures were never recorded. During the same period, the highest temperature, 118°F (47.8°C), was reached in June 1994 and the lowest, 5°F (–15.0°C), in December 1985. In a typical year, about 139 days had a maximum temperature of 90°F (32.2°C) or more, while about 27 days had minimum temperatures at or below freezing.

Along with prevailing westerlies, Pacific air masses lose most of their moisture on the windward side of mountain ranges parallel to the California coastline. Thus, leeward areas like the Pisgah SEZ area experience a lack of precipitation. For the period 1948 to 2009, annual

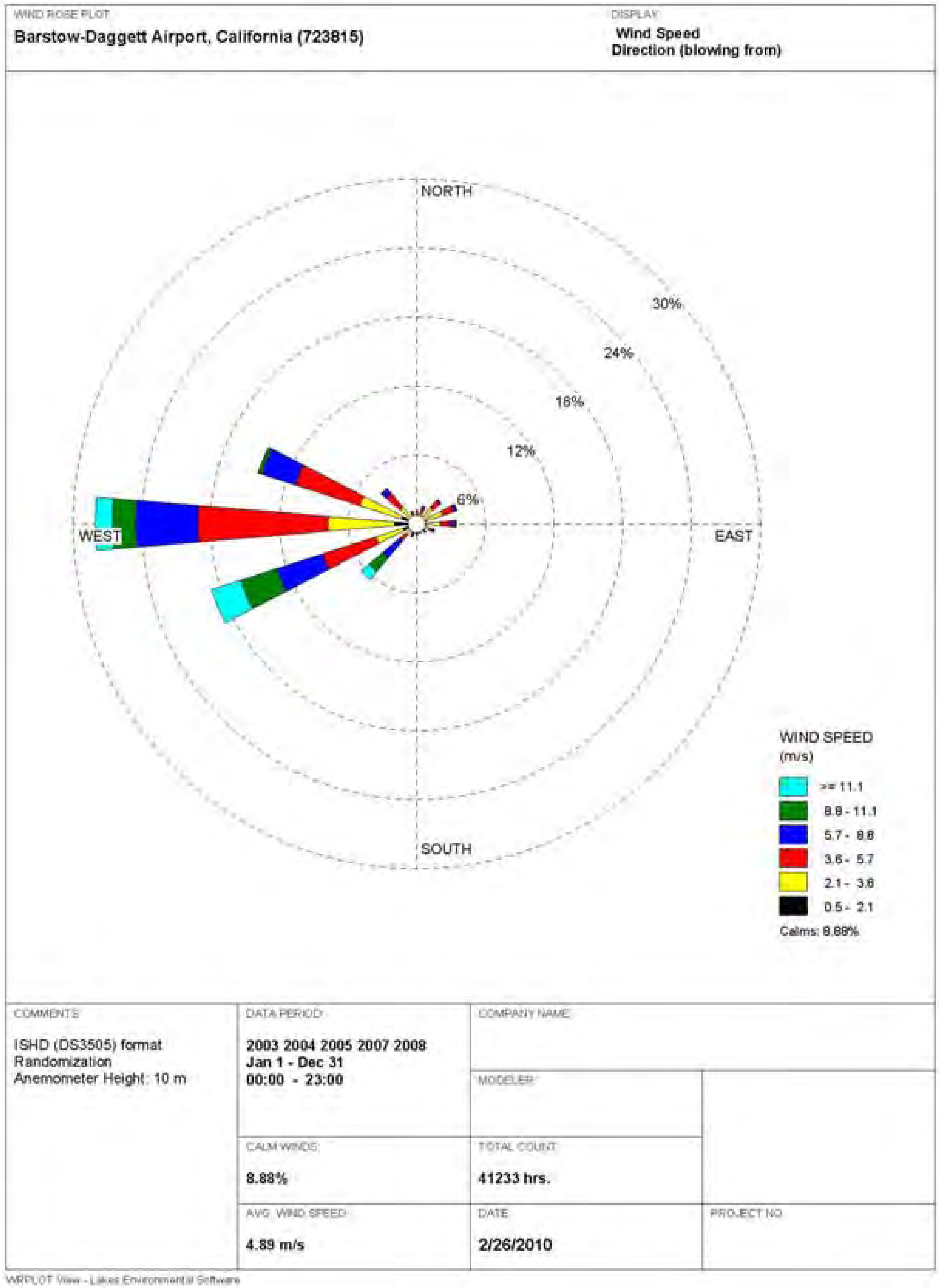

FIGURE 9.3.13.1-1 Wind Rose at 33 ft (10 m) at Barstow-Daggett Airport, Daggett, California, 2003–2005 and 2007–2008 (Source: NCDC 2010a)

precipitation at Barstow-Daggett Airport averaged about 3.84 in. (9.8 cm) (WRCC 2010b). There is an average of 23 days annually with measurable precipitation (0.01 in. [0.025 cm] or higher). About 39% of the annual precipitation occurs during winter months and the remaining precipitation is relatively evenly distributed over the other seasons. Snowfall at the airport is uncommon and mostly limited to December to January, infrequently in February and November. The annual average snowfall is about 0.8 in. (2.0 cm), and the highest monthly snowfall recorded was 14 in. (35.6 cm) in January 1949.

Because the area surrounding the proposed Pisgah SEZ is far from major water bodies (more than 110 mi [177 km]) and because surrounding mountain ranges block air masses from penetrating into the area, severe weather events, such as hurricanes and tornadoes, are rare.

Since 1993, 281 floods (mostly flash floods) were reported in San Bernardino County (NCDC 2010c) , with peaks in July and August. They caused a total of 12 deaths, 48 injuries, and considerable property and crop damage.

In San Bernardino County, 51 hail events in total have been reported since 1966; they caused minor property damage. Hail measuring 2.00 in. (5.1 cm) in diameter was reported in 1999. In San Bernardino County, 129 high wind events, which peaked in winter months, have been reported since 1996; they have caused eight deaths, 70 injuries, and significant property and crop damage (NCDC 2010c). A high wind event with a maximum wind speed of 120 mph (53.5 m/s) occurred in 1999. Since 1957, 101 thunderstorm wind events, peaking in summer months, have been reported; they caused one death, five injuries, and minor property damage. Many thunderstorms in California are accompanied by little to no precipitation, and lightning strikes sometimes cause forest fires (NCDC 2010b).

Since 1998, seven dust storm events were reported in San Bernardino County (NCDC 2010c). The ground surface of the SEZ is predominantly covered with gravelly alluvial sands and fine-grained eolian sands, which have relatively high dust storm potential. High winds can trigger large amounts of blowing dust in areas of San Bernardino County that have dry and loose soils with sparse vegetation. Dust storms can deteriorate air quality and visibility and have adverse effects on health.

Hurricanes and tropical storms formed off the coast of Central America and Mexico weaken over the cold waters off the California Coast. Accordingly, hurricanes rarely hit California. Historically, two tropical depressions have passed within 100 mi (160 km) of the proposed Pisgah SEZ (CSC 2010). Tornadoes in San Bernardino County, which encompasses the proposed Pisgah SEZ, occur infrequently. In the period 1950 to June 2010, a total of 29 tornadoes (0.5 per year) were reported in San Bernardino County (NCDC 2010c). However, most tornadoes occurring in San Bernardino County were relatively weak (i.e., seven were uncategorized, 20 were F0 or F1, and two were F2 on the Fujita tornado scale). Several of these tornadoes caused three injuries and minor property damage in total. Most tornadoes in San Bernardino County were reported far from the proposed Pisgah SEZ, except two F0 tornadoes occurring near Daggett about 16 mi (26 km) west of the SEZ.

9.3.13.1.2 Existing Air Emissions

San Bernardino County, which encompasses the proposed Pisgah SEZ, has many industrial emission sources, which are mainly concentrated over the valley region near the City of San Bernardino. No point source emissions are located around the proposed Pisgah SEZ, except a natural gas transmission facility about 2 mi (3 km) southwest of the SEZ. Mobile source emissions are substantial, because the county is crossed by several interstate highways, including I-10, I-15, I-40, and I-215. Data on annual emissions of criteria pollutants and VOCs in San Bernardino County for 2002 are presented in Table 9.3.13.1-1 (WRAP 2009). Emission data are classified into six source categories: point, area, onroad mobile, nonroad mobile, biogenic, and fire (wildfires, prescribed fires, agricultural fires, structural fires). In 2002, nonroad sources were major contributors to total SO_2 emissions (about 43%) and secondary contributors to total NO_x emissions (about 28%). Point sources were secondary contributors to SO_2 emissions (about 38%), but with contributions comparable to nonroad sources. Onroad sources were major contributors to NO_x and CO emissions (about 31% and 43%, respectively). Biogenic sources (i.e., vegetation—including trees, plants, and crops—and soils) that release naturally occurring emissions accounted for most of VOC emissions (about 91%) and secondarily contributed to CO emissions (about 19%). Area sources accounted for about 70% of PM_{10} and 47% of $PM_{2.5}$. Fire sources are secondary contributors to $PM_{2.5}$ emissions (about 27%).

TABLE 9.3.13.1-1 Annual Emissions of Criteria Pollutants and VOCs in San Bernardino County, California, Encompassing the Proposed Pisgah SEZ, 2002[a]

Pollutant	Emissions (tons/yr)
SO_2	3,774
NO_x	102,722
CO	373,128
VOC	512,377
PM_{10}	44,722
$PM_{2.5}$	17,879

[a] Includes point, area, onroad and nonroad mobile, biogenic, and fire emissions.

[b] Notation: CO = carbon monoxide; NO_x = nitrogen oxides; $PM_{2.5}$ = particulate matter with a diameter of ≤2.5 µm; PM_{10} = particulate matter with a diameter of ≤10 µm; SO_2 = sulfur dioxide; and VOC = volatile organic compounds.

Source: WRAP (2009).

In 2006, California produced about 483.9 MMt of *gross*[8] carbon dioxide equivalent (CO_2e)[9] emissions (CARB 2010a). GHG emissions in California increased by about 12% from 1990 to 2006, which was three-fourths of the increase in the national rate (about 16%). In 2006, transportation (38.4%) and electricity use (21.9%) were the primary contributors to gross GHG emission sources in California. Fossil fuel use in the residential, commercial, and industrial (RCI) sectors combined accounted for about 29.0% of total state emissions. California's *net* emissions were about 479.8 MMt CO_2e, taking into account carbon sinks from forestry activities and agricultural soils throughout the state. The EPA (EPA 2009a) also estimated 2005 emissions in California. Its

[8] Excluding GHG emissions removed as a result of forestry and other land uses and excluding GHG emissions associated with exported electricity.

[9] A measure used to compare the emissions from various GHGs on the basis of their global warming potential, defined as the cumulative radiative forcing effects of a gas over a specified time horizon resulting from the emission of a unit mass of gas relative to a reference gas, CO_2. The CO_2e for a gas is derived by multiplying the mass of the gas by the associated global warming potential.

estimate of CO_2 emissions from fossil fuel combustion was 390.6 MMt, which was comparable to the state's estimate. The transportation and RCI sectors accounted for about 58.7% and 30.5% of total CO_2 emissions, respectively, while electric power generation accounted for the remainder (about 10.8%).

9.3.13.1.3 Air Quality

CAAQS address the same six criteria pollutants as does NAAQS (CARB 2010b; EPA 2010a): SO_2, NO_2, CO, O_3, PM, PM_{10}, $PM_{2.5}$, and Pb. CAAQS are more stringent than NAAQS for most of criteria pollutants. In addition, California has set standards for some pollutants that are not addressed by NAAQS: visibility-reducing particles, sulfates, hydrogen sulfide, and vinyl chloride. The NAAQS and CAAQS for criteria pollutants are presented in Table 9.3.13.1-2.

Most San Bernardino County is located administratively within Southeast Desert Intrastate AQCR (Title 40, Part 81, Section 167 of the *Code of Federal Regulations* [40 CFR 81.167]), along with parts of Kern, Los Angeles, and Riverside Counties, and all of Imperial County. In addition, the Pisgah SEZ is located within the Mojave Desert Air Basin, one of 15 geographic air basins designated for the purpose of managing air resources in California, which also includes the desert portions of Kern, Los Angeles, Riverside, and San Bernardino Counties. Currently, the area surrounding the proposed SEZ is designated as being in unclassifiable attainment of NAAQS for all criteria pollutants, except O_3 and PM_{10} (40 CFR 81.305). Further, the area is designated as a nonattainment area for O_3, PM_{10}, and $PM_{2.5}$ based on CAAQS (CARB 2010c).

With a low population density, the Mojave Desert area has no significant emission sources of its own, except mobile emissions along interstate highways. Air quality in the Mojave Desert area primarily depends on upwind emissions transported from the South Coast Air Basin including Los Angeles. As a result of upwind emissions controls, air quality of the Mojave Desert area has improved, but concentrations of O_3 are still relatively high.

There are no ambient air monitoring stations in San Bernardino County near the proposed Pisgah SEZ. To characterize ambient air quality around the SEZ, two monitoring stations in San Bernardino County were chosen: Barstow, about 26 mi (42 km) to the west, and Victorville, about 48 mi (77 km) to the west–southwest of the SEZ. These monitoring stations are considered representative of the proposed SEZ. Ambient concentrations of NO_2, CO, O_3, and PM_{10} are recorded at Barstow, while those of SO_2, NO_2, CO, O_3, PM_{10}, and $PM_{2.5}$ are recorded at Victorville. No Pb measurements are made in the Mojave Desert area, so Pb measurements from the City of San Bernardino are presented to demonstrate that Pb is not a concern in San Bernardino County. The background concentrations of criteria pollutants at these stations for the period 2004 to 2008 are presented in Table 9.3.13.1-2 (EPA 2010b). The monitored SO_2, NO_2, CO, and Pb levels at either station were lower than their respective standards. Monitored $PM_{2.5}$ levels were approaching NAAQS and CAAQS, while PM_{10} levels were lower than NAAQS but higher than CAAQS. The highest O_3 concentrations exceeded both NAAQS and CAAQS.

TABLE 9.3.13.1-2 NAAQS, CAAQS, and Background Concentration Levels Representative of the Proposed Pisgah SEZ in San Bernardino County, California, 2004–2008

				Background Concentration Level	
Pollutant[a]	Averaging Time	NAAQS	CAAQS	Concentration[b,c]	Measurement Location, Year
SO_2	1-hour	0.075 ppm[d]	0.25 ppm	0.015 ppm (–; 6.0%)	Victorville, 2006
	3-hour	0.5 ppm	–[e]	0.009 ppm (1.8%; –)	Victorville, 2006
	24-hour	0.14 ppm	0.04 ppm	0.005 ppm (3.6%; 13%)	Victorville, 2007
	Annual	0.030 ppm	–	0.002 ppm (6.7%; –)	Victorville, 2006
NO_2	1-hour	0.100 ppm[f]	0.18 ppm	0.097 ppm (–; 54%)	Barstow, 2004
	Annual	0.053 ppm	0.030 ppm	0.023 ppm (43%; 77%)	Barstow, 2004
CO	1-hour	35 ppm	20 ppm	2.6 ppm (7.4%; 13%)	Barstow, 2006
	8-hour	9 ppm	9.0 ppm	1.2 ppm (13%; 13%)	Barstow, 2005
O_3	1-hour	0.12 ppm[g]	0.09 ppm	0.108 ppm (–; 120%)	Barstow, 2006
	8-hour	0.075 ppm	0.070 ppm	0.090 ppm (120%; 129%)	Barstow, 2008
PM_{10}	24-hour	150 $\mu g/m^3$	50 $\mu g/m^3$	103 $\mu g/m^3$ (69%; 206%)	Barstow, 2007
	Annual	–[h]	20 $\mu g/m^3$	30 $\mu g/m^3$ (–; 150%)	Barstow, 2007
$PM_{2.5}$	24-hour	35 $\mu g/m^3$	–	33 $\mu g/m^3$ (94%; –)	Victorville, 2004
	Annual	15.0 $\mu g/m^3$	12 $\mu g/m^3$	10.8 $\mu g/m^3$ (72%; 90%)	Victorville, 2004
Pb	30-day	–	1.5 $\mu g/m^3$	–	–
	Calendar quarter	1.5 $\mu g/m^3$	–	0.02 $\mu g/m^3$ (1.3%; –)	San Bernardino, 2007
	Rolling 3-month	0.15 $\mu g/m^3$[i]	–	–	–

a Notation: CO = carbon monoxide; NO_2 = nitrogen dioxide; O_3 = ozone; Pb = lead; $PM_{2.5}$ = particulate matter with a diameter of ≤2.5 μm; PM_{10} = particulate matter with a diameter of ≤10 μm; and SO_2 = sulfur dioxide.

b Monitored concentrations are the highest for calendar-quarter Pb; second-highest for all averaging times less than or equal to 24-hour averages, except fourth-highest daily maximum for 8-hour O_3 and the 98th percentile for 24-hour $PM_{2.5}$; and arithmetic mean for annual SO_2, NO_2, PM_{10}, and $PM_{2.5}$.

c First and second values in parentheses are background concentration levels as a percentage of NAAQS and CAAQS, respectively. Calculation of 1-hour SO_2, 1-hour NO_2, and rolling 3-month Pb to NAAQS was not made, because no measurement data based on new NAAQS standard are available.

d Effective August 23, 2010.

e A dash denotes “not applicable” or “not available.”

f Effective April 12, 2010.

g The EPA revoked the 1-hour O_3 standard in all areas, although some areas have continuing obligations under that standard (“anti-backsliding”).

h Effective December 18, 2006, the EPA revoked the annual PM_{10} standard of 50 $\mu g/m^3$.

i Effective January 12, 2009.

Sources: CARB (2010b); EPA (2010a,b).

The PSD regulations (see 40 CFR 52.21), which are designed to limit the growth of air pollution in clean areas, apply to a major new source or modification of an existing major source within an attainment or unclassified area (see Section 4.11.2.3). As a matter of policy, EPA recommends that the permitting authority notify the Federal Land Managers when a proposed PSD source would locate within 62 mi (100 km) of a sensitive Class I area. There are several Class I areas around the Pisgah SEZ, three of which are situated within 62 mi (100 km). The nearest Class I area is the Joshua Tree NP (40 CFR 81.405), about 43 mi (69 km) south–southeast of the Pisgah SEZ. This Class I area is not located downwind of prevailing winds at the Pisgah SEZ (Figure 9.3.13.1-1). The next nearest Class I areas within 62 mi (100 km) are the San Gorgonio and San Jacinto WAs, which are located about 44 mi (71 km) and 60 mi (96 km) south–southwest of the Pisgah SEZ, respectively.

9.3.13.2 Impacts

Potential impacts on ambient air quality associated with a solar project would be of most concern during the construction phase. Impacts on ambient air quality from fugitive dust emissions resulting from soil disturbances are anticipated, but they would be of short duration. During the operations phase, only a few sources with generally low-level emissions would exist for any of the four types of solar technologies evaluated. A solar facility would either not burn fossil fuels or burn only small amounts during operation. (For facilities using heat transfer fluids [HTFs], fuel could be used to maintain the temperature of the HTFs for more efficient daily start-up.) Conversely, solar facilities would displace air emissions that would otherwise be released from fossil fuel–fired power plants.

Air quality impacts shared by all solar technologies are discussed in detail in Section 5.11.1, and technology-specific impacts are discussed in Section 5.11.2. Impacts specific to the proposed Pisgah SEZ are presented in the following sections. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through any additional mitigation applied. Section 9.3.13.3 below identifies SEZ-specific design features of particular relevance to the Pisgah SEZ.

9.3.13.2.1 Construction

The Pisgah SEZ has a relatively flat terrain, thus only a minimum number of site preparation activities, perhaps with no large-scale earthmoving operations, would be required. However, fugitive dust emissions from soil disturbances during the entire construction phase would be a major concern because of the large areas that would be disturbed in a region that experiences windblown dust problems. Fugitive dusts, which are released near ground level, typically have more localized impacts than similar emissions from an elevated stack with additional plume rise induced by buoyancy and momentum effects.

Methods and Assumptions

Air quality modeling for PM_{10} and $PM_{2.5}$ emissions associated with construction activities was performed using the EPA-recommended AERMOD model (EPA 2009b). Details for emissions estimation, the description of AERMOD, input data processing procedures, and modeling assumptions are described in Section M.13 of Appendix M. Estimated air concentrations were compared with the applicable NAAQS/CAAQS levels at the site boundaries and nearby communities and with Prevention of Significant Deterioration (PSD) increment levels at nearby Class I areas.[10] However, no receptors were modeled for PSD analysis at the nearest Class I area, Joshua Tree NP, because it is about 43 mi (69 km) from the SEZ, which is over the maximum modeling distance of 31 mi (50 km) for the AERMOD. Rather, several regularly spaced receptors in the direction of the Joshua Tree NP were selected as surrogates for the PSD analysis. For the Pisgah SEZ, the modeling was conducted based on the following assumptions and input:

- Emissions were uniformly distributed over the 3,000 acres (12.1 km^2) each and 6,000 acres (24.3 km^2) in total, and in the western half of the SEZ, close to the nearest residences and towns such as Newberry Springs and Daggett;

- Surface hourly meteorological data came from the Barstow-Daggett Airport and upper air sounding data from Desert Rock/Mercury, Nevada, for the 2003 to 2005 and 2007 to 2008 period; and

- A receptor grid was regularly spaced over a modeling domain of 62 mi × 62 mi (100 km × 100 km), centered on the proposed SEZ, and there were additional discrete receptors at the SEZ boundaries.

Results

The modeling results for both PM_{10} and $PM_{2.5}$ concentration increments and total concentrations (modeled plus background concentrations) that would result from construction-related fugitive emissions are summarized in Table 9.3.13.2-1. Maximum 24-hour PM_{10} concentration increments modeled to occur at the site boundaries would be an estimated 457 $\mu g/m^3$, which far exceeds the relevant NAAQS level of 150 or CAAQS level of 50 $\mu g/m^3$. Total 24-hour PM_{10} concentrations of 560 $\mu g/m^3$ would also exceed the NAAQS and CAAQS levels at the SEZ boundary. However, high PM_{10} concentrations would be limited to the immediate areas surrounding the SEZ boundary and would decrease quickly with distance. Predicted maximum 24-hour PM_{10} concentration increments would be about 173 $\mu g/m^3$ at the nearby residence, which is located about 0.1 mi (0.2 km) south of the SEZ boundary.

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10 To provide a quantitative assessment, the modeled air impacts of construction were compared to the NAAQS/CAAQS levels and the PSD Class I increment levels. Although the Clean Air Act exempts construction activities from PSD requirements, a comparison with the Class I increment levels was used to quantify potential impacts. Only monitored data can be used to determine the attainment status. Modeled data are used to assess potential problems and as a consideration in the permitting process.

TABLE 9.3.13.2-1 Maximum Air Quality Impacts from Emissions Associated with Construction Activities for the Proposed Pisgah SEZ

			Concentration (µg/m^3)				Percentage of NAAQS/CAAQS[e]	
Pollutant[a]	Averaging Time	Rank[b]	Maximum Increment[b]	Background[c]	Total	NAAQS/ CAAQS[d]	Increment	Total
PM_{10}	24 hours	H6H	457	103	560	150/50	305/914	373/1,120
	Annual	–	83.7	30	114	–[f]/20	–/419	–/569
$PM_{2.5}$	24 hours	H8H	31.4	33	64.4	35/–	90/–	184/–
	Annual	–	8.4	10.8	19.2	15.0/12	56/70	128/160

a $PM_{2.5}$ = particulate matter with a diameter of ≤2.5 µm; PM_{10} = particulate matter with a diameter of ≤10 µm.

b Concentrations for attainment demonstration are presented. H6H = highest of the sixth-highest concentrations at each receptor over the 5-year period. H8H = highest of the multiyear average of the eighth-highest concentrations at each receptor over the five-year period. For the annual average, multiyear averages of annual means over the five-year period are presented. Maximum concentrations are predicted to occur at the site boundaries.

c See Table 9.3.13.1-2.

d First and second values are NAAQS and CAAQS, respectively.

e First and second values are concentration levels as a percentage of NAAQS and CAAQS, respectively.

f A dash denotes "not applicable."

Predicted maximum 24-hour PM_{10} concentration increments would be about 18 µg/m^3 at Ludlow (a downwind receptor about 12 mi [19 km] east-southeast of the SEZ); about 10 µg/m^3 at Harvard and Newberry Springs; and about 4 µg/m^3 at Daggett. Annual average modeled PM_{10} concentration increments and total concentrations (increment plus background) at the SEZ boundary would be about 83.7 µg/m^3 and 114 µg/m^3, respectively, which are much higher than the CAAQS level of 20 µg/m^3. Annual PM_{10} increments would be much lower, about 13.0 µg/m^3, at the nearest residence, adjacent to the northwestern corner of the SEZ boundary, about 0.7 µg/m^3 at Ludlow, about 0.4 µg/m^3 at Newberry Springs, and about 0.1 µg/m^3 at Daggett and Harvard.. Total 24-hour $PM_{2.5}$ concentrations would be 64 µg/m^3 at the SEZ boundary, which is much higher than the NAAQS level of 35 µg/m^3; modeled increment and background concentrations make comparable contributions to this total. The total annual average $PM_{2.5}$ concentration would be 19.2 µg/m^3, which is above the NAAQS and CAAQS levels of 15.0 and 12 µg/m^3, respectively. At the nearest residence, predicted maximum 24-hour and annual $PM_{2.5}$ concentration increments would be about 7.3 and 1.3 µg/m^3, respectively.

Predicted 24-hour and annual PM_{10} concentration increments at the surrogate receptors for the nearest Class I Area—Joshua Tree NP—would be about 8.4 and 0.2 µg/m^3, or 105 and 4.4%, respectively, of the PSD increments for Class I area. The surrogate receptor where the maximum concentration occurs is more than 28 mi (44 km) from the Joshua Tree NP, and thus predicted concentrations in Joshua Tree NP would be lower than the above values (about 64% of the PSD increments for 24-hour PM_{10}), considering the same decay ratio with distance.

In conclusion, predicted 24-hour and annual PM_{10} and $PM_{2.5}$ concentration levels could exceed the standard levels at the SEZ boundaries and in immediate surrounding areas during the construction of solar facilities. To reduce potential impacts on ambient air quality and in compliance with programmatic design features, aggressive dust control measures would be used. Potential air quality impacts on nearby communities would be much lower. Modeling indicates that emissions from construction activities are not anticipated to exceed Class I PSD PM_{10} increments at the nearest federal Class I area (Joshua Tree NP). Construction activities are not subject to the PSD program, and the comparison provides only a screen for gauging the magnitude of the impact. Accordingly, it is anticipated that impacts of construction activities on ambient air quality would be moderate and temporary.

Construction emissions from the engine exhaust of heavy equipment and vehicles could cause impacts on AQRVs (e.g., visibility and acid deposition) at the nearby federal Class I areas. SO_x emissions from engine exhaust would be very low, because programmatic design features would require that ultra-low-sulfur fuel with a sulfur content of 15 ppm be used. NO_x emissions from engine exhaust would be primary contributors to potential impacts on AQRVs. Construction-related emissions are temporary in nature and thus would cause some unavoidable but short-term impacts.

For this analysis, the impacts of construction and operation of transmission lines outside of the SEZ were not assessed, assuming that the existing regional 230-kV transmission line might be used to connect some new solar facilities to load centers, and that additional project-specific analysis would be done for new transmission construction or line upgrades. However, some construction of transmission lines could occur within the SEZ. Potential impacts on ambient air quality would be a minor component of construction impacts in comparison with solar facility construction and would be temporary in nature.

9.3.13.2.2 Operations

Emission sources associated with the operation of a solar facility would include auxiliary boilers; vehicle (commuter, visitor, support, and delivery) traffic; maintenance (e.g., mirror cleaning and repair and replacement of damaged mirrors); and drift from cooling towers for the parabolic trough or power tower technology if wet cooling was implemented (drift comprises low-level particulate emissions).

The type of emission sources caused by and offset by operation of a solar facility are discussed in Section M.13.4 of Appendix M.

Estimates of potential air emissions displaced by the solar project development at the Pisgah SEZ are presented in Table 9.3.13.2-2. Total power generation capacity ranging from 2,129 to 3,832 MW is estimated for the Pisgah SEZ for various solar technologies (see Section 9.3.2). The estimated amount of emissions avoided for the solar technologies

TABLE 9.3.13.2-2 Annual Emissions from Combustion-Related Power Generation Displaced by Full Solar Development of the Proposed Pisgah SEZ

Area Size (acres)	Capacity (MW)[a]	Power Generation (GWh/yr)[b]	Emissions Displaced (tons/yr; 10^3 tons/yr for CO_2)[c]			
			SO_2	NO_x	Hg	CO_2
23,950	2,129–3,832	3,730–6,714	477–858 (2,817–5,071)	783–1,410 (4,152–7,474)	0.007–0.012 (0.033–0.059)	1,853–3,336 (2,943–5,297)
Percentage of total emissions from electric power systems in California[d]			3.5–6.3%	3.5–6.3%	3.5–6.3%	3.5–6.3%
Percentage of total emissions from all source categories in California[e]			0.67–1.2%	0.07–0.12%	–[f]	0.43–0.77%
Percentage of total emissions from electric power systems in the six-state study area[d]			0.19–0.34% (1.1–2.0%)	0.21–0.38% (1.1–2.0%)	0.24–0.42% (1.1–2.0%)	0.71–1.3% (1.1–2.0%)
Percentage of total emissions from all source categories in the six-state study area[e]			0.10–0.18% (0.60–1.1%)	0.03–0.05% (0.15–0.28%)	– (–)	0.22–0.40% (0.35–0.64%)

[a] It is assumed that the SEZ would eventually have development on 80% of the lands and that a range of 5 acres (0.020 km^2) per MW (for parabolic trough technology) to 9 acres (0.036 km^2) per MW (power tower, dish engine, and PV technologies) would be required.

[b] Assumed a capacity factor of 20%.

[c] Composite combustion-related emission factors for SO_2, NO_x, Hg, and CO_2 of 0.26, 0.42, 3.7×10^{-6}, and 994 lb/MWh, respectively, were used for the state of California. Values in parentheses are estimated based on composite combustion-related emission factors for SO_2, NO_X, Hg, and CO_2 of 1.51, 2.23, 1.8×10^{-5}, and 1,578 lb/MWh, respectively, averaged over six southwestern states.

[d] Emission data for all air pollutants are for 2005.

[e] Emission data for SO_2 and NO_x are for 2002, while those for CO_2 are for 2005.

[f] A dash indicates “not estimated.”

Sources: EPA (2009a,c); WRAP (2009).

evaluated depends only on the megawatts of conventional fossil fuel–generated power displaced, because a composite emission factor per megawatt-hour of power by conventional technologies is assumed (EPA 2009c). If the Pisgah SEZ was fully developed, it is expected that emissions avoided would be substantial. Development of solar power in the SEZ would result in avoided air emissions ranging from 3.5% to 6.3% of total emissions of SO_2, NO_X, Hg, and CO_2 from electric power systems in the state of California (EPA 2009c). Avoided emissions would be up to 1.3% of total emissions from electric power systems in the six-state study area. When compared with all source categories, power production from the solar facilities would displace up to 1.2% of SO_2, 0.12% of NO_x, and 0.77% of CO_2 emissions in the state of California

(EPA 2009a; WRAP 2009). These emissions would be up to 0.40% of total emissions from all source categories in the six-state study area. Power generation from fossil fuel–fired power plants accounts for only 53% of the total electric power generation in California, most of which is from natural-gas combustion. Thus, solar facilities to be built in the Pisgah SEZ could considerably reduce fuel-combustion-related emissions in California but relatively less so than facilities built in other states with higher fossil fuel use rates.

About one-quarter of electricity consumed in California is generated out of state, with about three-quarters of this amount coming from the southwestern states. Thus it is possible that a solar facility in California would replace power from fossil fuel–fired power plants outside of California but within the six-state study area. It is also possible that electric power transfer between the states will increase in the future. To assess the potential region-wide emissions benefit, emissions being displaced were also estimated based on composite emission factors averaged over the six-state study area. For SO_2, NO_x, and Hg, composite emission factors for the six-state study area would be about 5 to 6 times higher than those for California alone. For CO_2, the six-state emission factor is about 60% higher than the California-only emission factor. If the Pisgah SEZ were fully developed, emissions avoided would be considerable. Development of solar power in the SEZ would result in avoided air emissions ranging from 1.1 to 2.0% of total emissions of SO_2, NO_x, Hg, and CO_2 from electric power systems in the six southwestern states. These emissions would be up to 1.1% of total emissions from all source categories in the six-state study area.

As discussed in Section 5.11.1.5, the operation of associated transmission lines would generate some air pollutants from activities such as periodic site inspections and maintenance. However, these activities would occur infrequently, and the amount of emissions would be small. In addition, transmission lines could produce minute amounts of O_3 and its precursor NO_x associated with corona discharge (i.e., the breakdown of air near high-voltage conductors), which is most noticeable for higher voltage lines during rain or very humid conditions. Since the Pisgah SEZ is located in an arid desert environment, these emissions would be small, and potential impacts on ambient air quality associated with transmission lines would be negligible, considering the infrequent occurrences and small amount of emissions from corona discharges.

9.3.13.2.3 Decommissioning/Reclamation

As discussed in Section 5.11.1.4, decommissioning/reclamation activities are similar to construction activities but are on a more limited scale and of shorter duration. Potential impacts on ambient air quality would be correspondingly less than those from construction activities. Decommissioning activities would last for a short period, and their potential impacts would be moderate and temporary. The same design features adopted during the construction phase would also be implemented during the decommissioning phase (Section 5.11.3).

9.3.13.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features are required. Limiting dust generation during construction and operations at the proposed Pisgah SEZ (such as increased watering frequency or road paving or treatment) is a required programmatic design feature under BLM's Solar Energy Program. These extensive fugitive dust control measures would keep off-site PM levels as low as possible during construction.

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9.3.14 Visual Resources

9.3.14.1 Affected Environment

The proposed Pisgah SEZ is located within the CDCA in San Bernardino County in southeastern California. The SEZ (23,950 acres [97 km^2]) occupies an area approximately 10 mi (16 km) north to south (at greatest extent) and 12 mi (19 km) east to west and is located approximately 7 mi (11 km) (at closest approach) east of the community of Newberry Springs, California, and 12 mi (19 km) west to northwest of the community of Ludlow. I-40 and Historic Route 66 pass through the SEZ, and I-15 is 11 mi (18 km) north of the far northern boundary. The SEZ and surrounding mountain ranges are shown in Figure 9.3.14.1-1. The SEZ ranges in elevation from 1,783 ft (544 m) in the southwestern portion of the SEZ along I-40, to 2,370 ft (722 m) near the Cady Mountains the northeastern portion of the SEZ.

The Pisgah SEZ is located in the Mojave Basin and Range ecoregion (EPA 2007) and the USFS's Bullion Mountains-Bristol Lake subsection. The subsection is characterized by gently to moderately sloping alluvial fans and volcanic flows, nearly level basin floor and dry lake bed, steep mountains and moderately steep hills (USFS 1997).

The SEZ is located within the east-west trending Mojave Valley. The valley falls between the Cady and Bristol Mountains to the north and northeast and the Bullion, Lava Bed, Rodman, and Newberry Mountains to the south and southwest. The SEZ is located between the Rodman and Lava Bed Mountains to the south and the Cady Mountains, which rise abruptly immediately northeast of the SEZ. The valley floor ranges from approximately 1,800 to 2,200 ft (549 to 671 m) in elevation; the mountains rise to between 3,000 ft and 4,400 ft (914 and 1,341 m) in elevation. The Pisgah SEZ is relatively flat, but the northeastern portion slopes upward toward the Cady Mountains. Portions of the SEZ include dark lava flows, mostly devoid of vegetation, and sandy areas with sparse vegetation. Pisgah Crater is located on the south border of the SEZ.

Vegetation consists mostly of widely spaced creosote shrubs. Because vegetation is generally sparse, the blacks of lava flows, the light tans of sand, and the grays of gravel beds are prominent in many areas, and the wide spacing of the creosotebushes results in generally coarse foreground textures. In most locations, the vegetation is too short and too sparse to screen views. There are some scattered tamarisk trees, but otherwise the SEZ lacks hardwood vegetation. This landscape type is common within the region.

No permanent water features are present on the SEZ. Troy Lake is a dry lake located within the western portion of the SEZ. It is subject to intermittent flooding.

The mountain ranges surrounding the SEZ generally block views to and from neighboring valleys; however, the view is more open to the east of the SEZ. Within the valley, the general lack of topographic relief and vegetative screening affords panoramic views of the SEZ, the rest of the valley, and the surrounding mountains. Panoramic views of the SEZ are shown in Figures 9.3.14.1-2, 9.3.14.1-3, and 9.3.14.1-4.

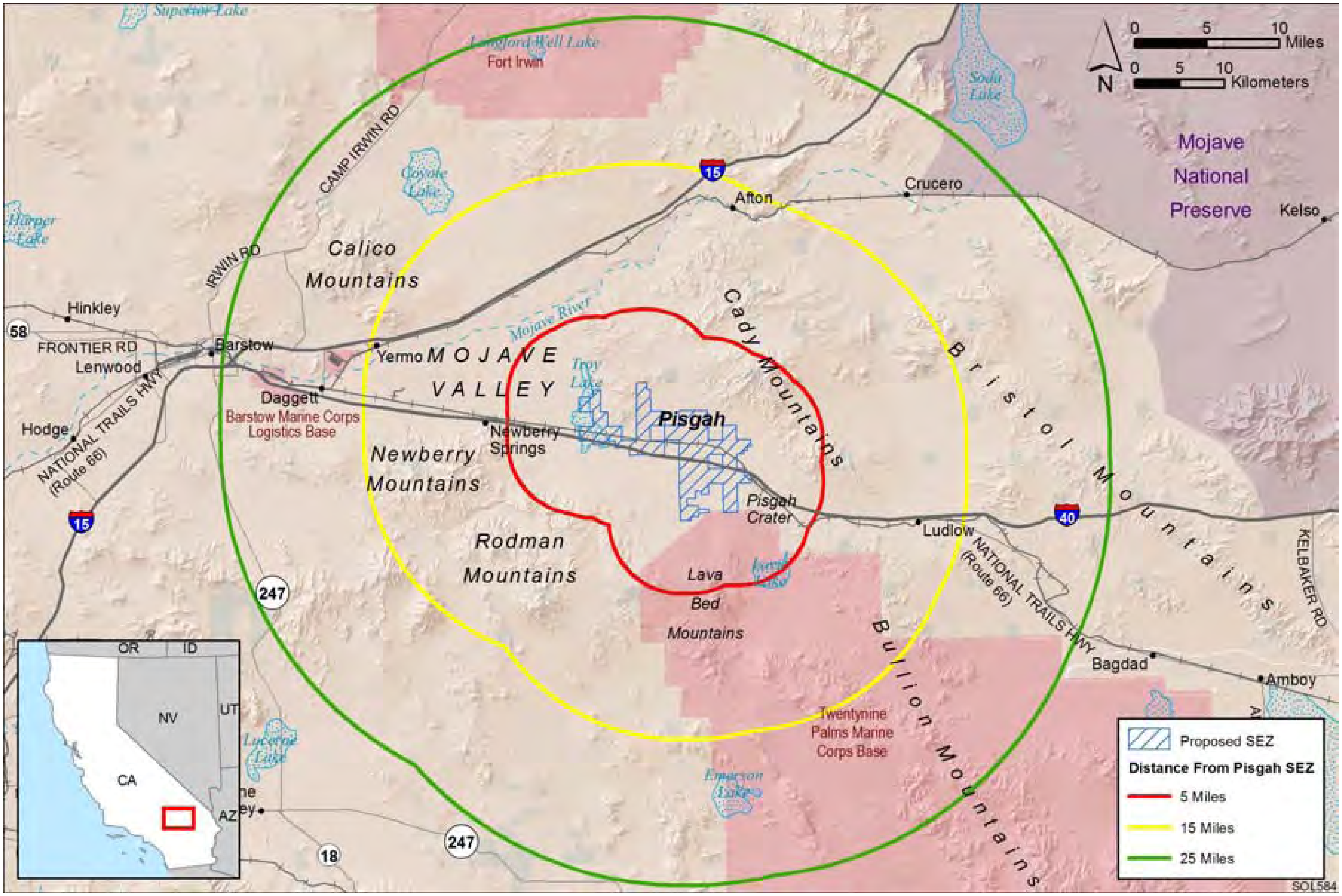

FIGURE 9.3.14.1-1 Proposed Pisgah SEZ and Surrounding Lands

FIGURE 9.3.14.1-2 Approximately 120° Panoramic View from the Far Western Portion of the Proposed Pisgah SEZ Facing East, Including Cady Mountains

FIGURE 9.3.14.1-3 Approximately 150° Panoramic View from I-40 in the South-Central Portion of the Proposed Pisgah SEZ Facing West, Including Lava Fields, Route 66 (Left), Rodman Mountains (Background Left), and Cady Mountains (Background Right)

FIGURE 9.3.14.1-4 Approximately 180° Panoramic View from Route 66 in the Eastern Portion of the Proposed Pisgah SEZ Facing East, Including I-40 and Cady Mountains at Left, and Pisgah Crater at Far Right

Although the SEZ itself is generally natural appearing away from I-40, cultural modifications within the SEZ detract somewhat from the SEZ's scenic quality. In addition to I-40, Route 66 and several gravel and dirt roads of various sizes cross the SEZ. Traffic on I-40 is visible from much of the SEZ. There is also a railroad line, transmission lines, and a substation located on the SEZ; however, the SEZ is large enough that these elements do not dominate views in most of the SEZ.

Off-site views are dominated by the Cady Mountains to the northeast and Rodman Mountains to the southwest of the SEZ. The low, black form of Pisgah Crater is visible from much of the southeast portion of the SEZ. Although the scenic quality of the valley floor is low, these adjacent mountain ranges and volcanic cinder cone add to the scenic quality of the SEZ. The colors of the mountains ranges are generally brown and garnet. Black lava flows visible from the SEZ provide additional color contrast and visual interest.

The mountain slopes and peaks around the SEZ are generally visually pristine, as they are partially within congressionally designated WAs or WSAs. The boundary of the Cady Mountains WSA is immediately adjacent to portions of the northern boundary of the SEZ; the Rodman WA is visible to the southwest; and the Newberry Mountains WA is visible to the west of the SEZ. In addition to these areas, other important scenic resources within the 25-mi (40-km) viewshed of the SEZ include the Kelso Dunes, Bristol Mountains WAs, the Soda Mountains WSA, the Old Spanish National Historic Trail, and the historic Route 66 Highway.

While the lands to the north, east, and south of the SEZ are mostly undeveloped, the land to the west includes agricultural fields utilizing center-pivot irrigation. Isolated ranches and homes and associated structures are visible in private lands adjacent to the SEZ, as are roads and local traffic. Scattered tanks and other structures associated with ranching and farming are visible, primarily west of the SEZ.

The BLM conducted a VRI for the SEZ and surrounding lands in 2010 (BLM 2010h). The VRI evaluates BLM-administered lands based on scenic quality; sensitivity level, in terms of public concern for preservation of scenic values in the evaluated lands; and distance from travel routes or KOPs. Based on these three factors, BLM-administered lands are placed into one of four VRI Classes, which represent the relative value of the visual resources. Classes I and II are the most valued; Class III represents a moderate value; and Class IV represents the least value. Class I is reserved for specially designated areas, such as national wildernesses and other congressionally and administratively designated areas where decisions have been made to preserve a natural landscape. Class II is the highest rating for lands without special designation. More information about VRI methodology is available in Section 5.12 and in *Visual Resource Inventory*, BLM Manual Handbook 8410-1 (BLM 1986a).

The VRI map for the SEZ and surrounding lands is shown in Figure 9.3.14.1-5. The VRI values for the SEZ and immediate surroundings are primarily VRI Class IV, indicating low relative visual values, but with an area assigned VRI Class III (moderate visual values) in the far northeastern portion of the SEZ near the Cady Mountains, and three smaller areas inventoried as VRI Class II. One of the VRI Class II areas is associated with lava flows in the eastern portion of the SEZ, while the other two VRI Class II areas are associated with areas of higher physical

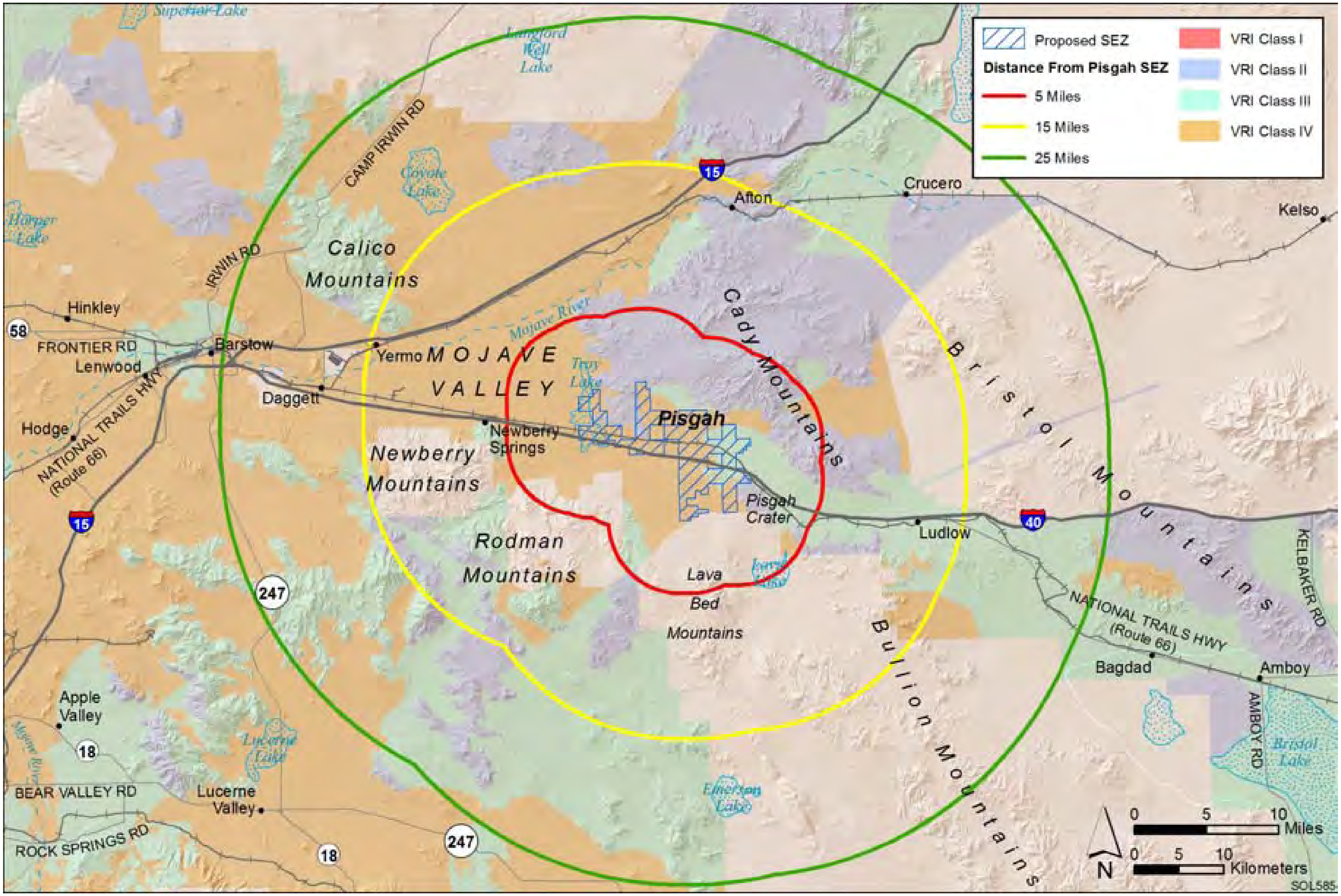

FIGURE 9.3.14.1-5 Visual Resource Inventory Values for the Proposed Pisgah SEZ and Surrounding Lands

relief in the northwestern portion of the SEZ. The inventory indicates low to moderate scenic quality for the SEZ and its immediate surroundings, with “moderate” ratings for portions of the SEZ based in part on landscape features of interest, such as the lava flows, the dry lake, and rolling terrain in some parts of the SEZ. Positive scenic quality attributes also included some variety in vegetation types and color, and the off-site views of the surrounding mountain ranges. The inventory indicates a moderate to high level of use, largely due to traffic on I-40 and Historic Route 66, and a moderate to high level of public interest, due primarily to national interest in Route 66 and the backcountry experience of Cady Mountains. Also noted in the inventory is the special area sensitivity due to the Pisgah SEZ’s inclusion within the CDCA.

Lands within the 25-mi (40-km), 650-ft (198-m) viewshed of the SEZ contain 56,711 acres [229.50 km^2) of VRI Class II areas, primarily northeast of the SEZ in the Cady Mountains; 70,816 acres [286.58 km^2) of Class III areas, primarily east of the SEZ in the Mojave Valley; and 301,758 acres [1,221.17 km^2) of VRI Class IV areas, primarily west of the SEZ in the Mojave Valley.

The BLM has not assigned Visual Resource Management (VRM) classes for the SEZ and surrounding BLM lands. More information about the BLM’s VRM program is available in Section 5.12 and in *Visual Resource Management*, BLM Manual Handbook 8400 (BLM 1984).

9.3.14.2 Impacts

The potential for impacts from utility-scale solar energy development on visual resources within the proposed Pisgah SEZ and surrounding lands, as well as the impacts of related developments (e.g., access roads and transmission lines) outside of the SEZ, is presented in this section.

Site-specific impact assessment is needed to systematically and thoroughly assess visual impact levels for a particular project. Without precise information about the location of a project and a relatively complete and accurate description of its major components and their layout, it is not possible to assess precisely the visual impacts associated with the facility. However, if the general nature and location of a facility are known, a more generalized assessment of potential visual impacts can be made by describing the range of expected visual changes and discussing contrasts typically associated with these changes. In addition, a general analysis can be used to identify sensitive resources that may be at risk if a future project is sited in a particular area. Detailed information about the methodology employed for the visual impact assessment for this Solar Energy PEIS, including assumptions and limitations, is presented in Appendix M.

Potential Glint and Glare Impacts. Similarly, the nature and magnitude of potential glint- and glare-related visual impacts for a given solar facility is highly dependent on viewer position, sun angle, the nature of the reflective surface and its orientation relative to the sun and the viewer, atmospheric conditions and other variables. The determination of potential impacts from glint and glare from solar facilities within a given proposed SEZ would require precise knowledge of these variables, and is not possible given the scope of the PEIS. Therefore, the following analysis does not describe or suggest potential contrast levels arising from glint and glare for facilities that might be developed within the SEZ; however, it should be assumed that glint and glare are possible visual impacts from *any* utility-scale solar facility, regardless of size, landscape setting, or technology type. The occurrence of glint and glare at solar facilities could potentially cause large, but temporary, increases in brightness and visibility of the facilities. The visual contrast levels projected for sensitive visual resource areas discussed in the following analysis do not account for potential glint and glare effects; however, these effects would be incorporated into a future site-and project-specific assessment that would be conducted for specific proposed utility-scale solar energy projects. For more information about potential glint and glare impacts associated with utility-scale solar energy facilities, see Section 5.12 of this PEIS.

9.3.14.2.1 Impacts on the Proposed Pisgah SEZ

Some or all of the SEZ could be developed for one or more utility-scale solar energy projects, utilizing one or more of the solar energy technologies described in Appendix E. Because of the industrial nature and large size of utility-scale solar energy facilities, large visual impacts on the SEZ would occur as a result of the construction, operation, and decommissioning of solar energy projects. In addition, large impacts could occur at solar facilities utilizing highly reflective surfaces or major light-emitting facility components (solar dish, parabolic trough, and power tower technologies), with lesser impacts associated with reflective surfaces expected from PV facilities. These impacts would be expected to involve major modification of the existing character of the landscape and would likely dominate the views from nearby locations. Additional, and potentially large, impacts would occur as a result of the construction, operation, and decommissioning of access roads and transmission lines within the SEZ (however no new transmission lines construction outside of the proposed SEZ was assessed; see Section 9.3.1.2). While the primary visual impacts associated with solar energy development within the SEZ would occur during daylight hours, lighting required for utility-scale solar energy facilities would be a potential source of visual impacts at night, both within the SEZ and on surrounding lands.

Common and technology-specific visual impacts from utility-scale solar energy development, as well as impacts associated with electric transmission lines, are discussed in Section 5.12 of this PEIS. Impacts would last throughout construction, operation, and decommissioning, and some impacts could continue after project decommissioning. Visual impacts resulting from solar energy development in the SEZ would be in addition to impacts from solar energy development and other development that may occur on other public or private lands within the SEZ viewshed, and are subject to cumulative effects. For discussion of cumulative impacts, see Section 9.3.22.4.13 of the PEIS.

The changes described previously would be expected to be consistent with BLM visual resource management objectives for VRM Class IV, as seen from nearby KOPs. VRM Class IV objectives include major modification of the existing character of the landscape. The BLM has not assigned VRM classes to the SEZ and surrounding lands. More information about the BLM VRM program is available in Section 5.12 and in *Visual Resource Management*, BLM Manual

Handbook 8400 (BLM 1984). More information about impact determination using the BLM's VRM program is available in Section 5.12 and in *Visual Resource Contrast Rating*, BLM Manual Handbook 8431-1 (BLM 1986b).

Implementation of the programmatic design features intended to reduce visual impacts (described in Appendix A, Section A.2.2, of the PEIS) would be expected to reduce visual impacts associated with utility-scale solar energy development within the SEZ; however, the degree of effectiveness of these design features could be assessed only at the site- and project-specific level. Given the large scale, reflective surfaces, and strong regular geometry of utility-scale solar energy facilities, and the lack of screening vegetation and landforms within the SEZ viewshed, siting the facilities away from sensitive visual resource areas and other sensitive viewing areas would be the primary means of mitigating visual impacts. The effectiveness of other visual impact mitigation measures would generally be limited, but would be important to reduce visual contrasts to the greatest extent possible.

9.3.14.2.2 Impacts on Lands Surrounding the Proposed Pisgah SEZ

Because of the large size of utility-scale solar energy facilities and the generally flat, open nature of the proposed SEZ, lands outside the SEZ would be subjected to visual impacts related to construction, operation, and decommissioning of utility-scale solar energy facilities. The affected areas and extent of impacts would depend on a number of visibility factors and viewer distance (for a detailed discussion of visibility and related factors, see Section 5.12). A key component in determining impact levels is the intervisibility between the project and potentially affected lands; if topography, vegetation, or structures screen the project from viewer locations, there is no impact.

Preliminary viewshed analyses were conducted to identify which lands surrounding the proposed SEZ could have views of solar facilities in at least some portion of the SEZ (see Appendix M for information on assumptions and limitations of the methods used). Four viewshed analyses were conducted, assuming four different heights representative of project elements associated with potential solar energy technologies: PV and parabolic trough arrays (24.6 ft [7.5 m]), solar dishes and power blocks for CSP technologies (37 ft [11.6 m]), transmission towers and short solar power towers (150 ft [45.7 m]), and tall solar power towers (650 ft [198.1 m]). Viewshed maps for the SEZ for all four solar technology heights are available in Appendix N.

Figure 9.3.14.2-1 shows the combined results of the viewshed analyses for all four solar technologies. The colored portions indicate areas with clear lines of sight to one or more areas within the SEZ and from which solar facilities within these areas of the SEZ would be expected to be visible, assuming the absence of screening vegetation or structures and adequate lighting and other atmospheric conditions. The light brown areas are locations from which PV and parabolic trough arrays located in the SEZ could be visible. Solar dishes and power blocks for CSP technologies would be visible from the areas shaded in light brown and the additional areas shaded in light purple. Transmission towers and short solar power towers would be visible

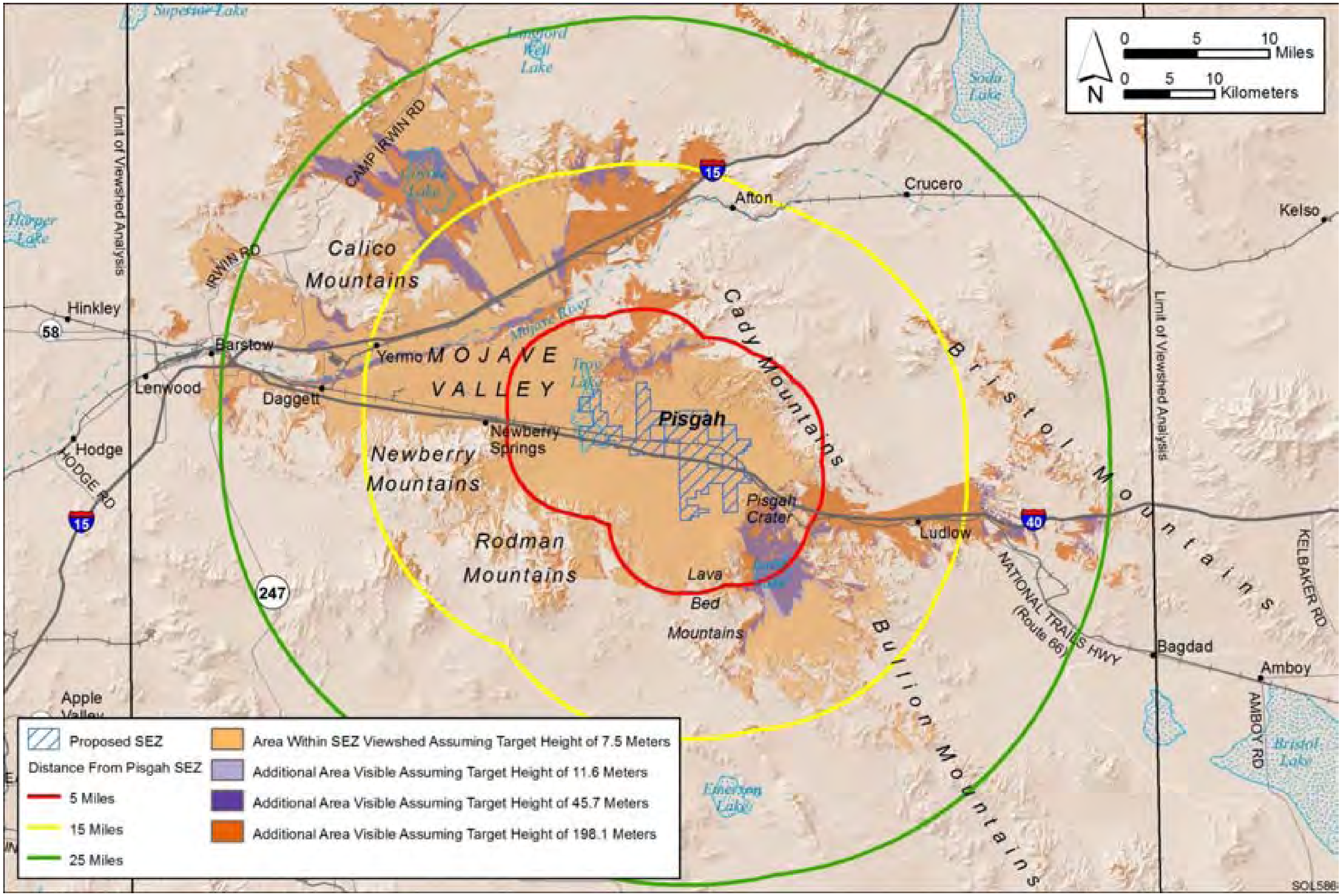

FIGURE 9.3.14.2-1 Viewshed Analyses for the Proposed Pisgah SEZ and Surrounding Lands, Assuming Solar Technology Heights of 24.6 ft (7.5 m), 37 ft (11.6 m), 150 ft (45.7 m), and 650 ft (198.1 m) (shaded areas indicate lands from which solar development within the SEZ could be visible)

from the areas shaded light brown, light purple, and the additional areas shaded in dark purple. Power tower facilities located in the SEZ could be visible from areas shaded light brown, light purple, dark purple, and at least the upper portions of power tower receivers could be visible from in the additional areas shaded in medium brown.

For the following visual impact discussion, the tall solar power tower (650 ft [198.1 m]) and PV and parabolic trough array (24.6 ft [7.5 m]) viewsheds are shown in the figures and discussed in the text. These heights represent the maximum and minimum landscape visibility for solar energy technologies analyzed in the PEIS. Viewsheds for solar dish and CSP technology power blocks (37 ft [11.6 m]), and for transmission towers and short solar power towers (150 ft [45.7 m]) are presented in Appendix N. The visibility of these facilities would fall between that for tall power towers and PV and parabolic trough arrays.

Impacts on Selected Federal-, State-, and BLM-Designated Sensitive Visual Resource Areas

Figure 9.3.14.2-2 shows the results of a GIS analysis that overlays selected federal-, state-, and BLM-designated sensitive visual resource areas onto the combined tall solar power tower (650 ft [198.1 m]) and PV and parabolic trough array (24.6 ft [7.5 m]) viewsheds, in order to illustrate which of these sensitive visual resource areas could have views of solar facilities within the SEZ and therefore potentially would be subject to visual impacts from those facilities. Distance zones that correspond with the BLM's VRM system-specified foreground-middleground distance (5 mi [7 km]), background distance (15 mi [24 km]), and a 25-mi (40-km) distance zone are shown as well, in order to indicate the effect of distance from the SEZ on impact levels, which are highly dependent on distance.

The scenic resources included in the analyses were as follows:

- National Parks, National Monuments, National Recreation Areas, National Preserves, National Wildlife Refuges, National Reserves, National Conservation Areas, National Historic Sites;
- Congressionally authorized Wilderness Areas;
- Wilderness Study Areas;
- National Wild and Scenic Rivers;
- Congressionally authorized Wild and Scenic Study Rivers;
- National Scenic Trails and National Historic Trails;
- National Historic Landmarks and National Natural Landmarks;
- All-American Roads, National Scenic Byways, State Scenic highways, and BLM- and USFS-designated scenic highways/byways, BLM-designated Special Recreation Management Areas; and
- ACECs designated because of outstanding scenic qualities.

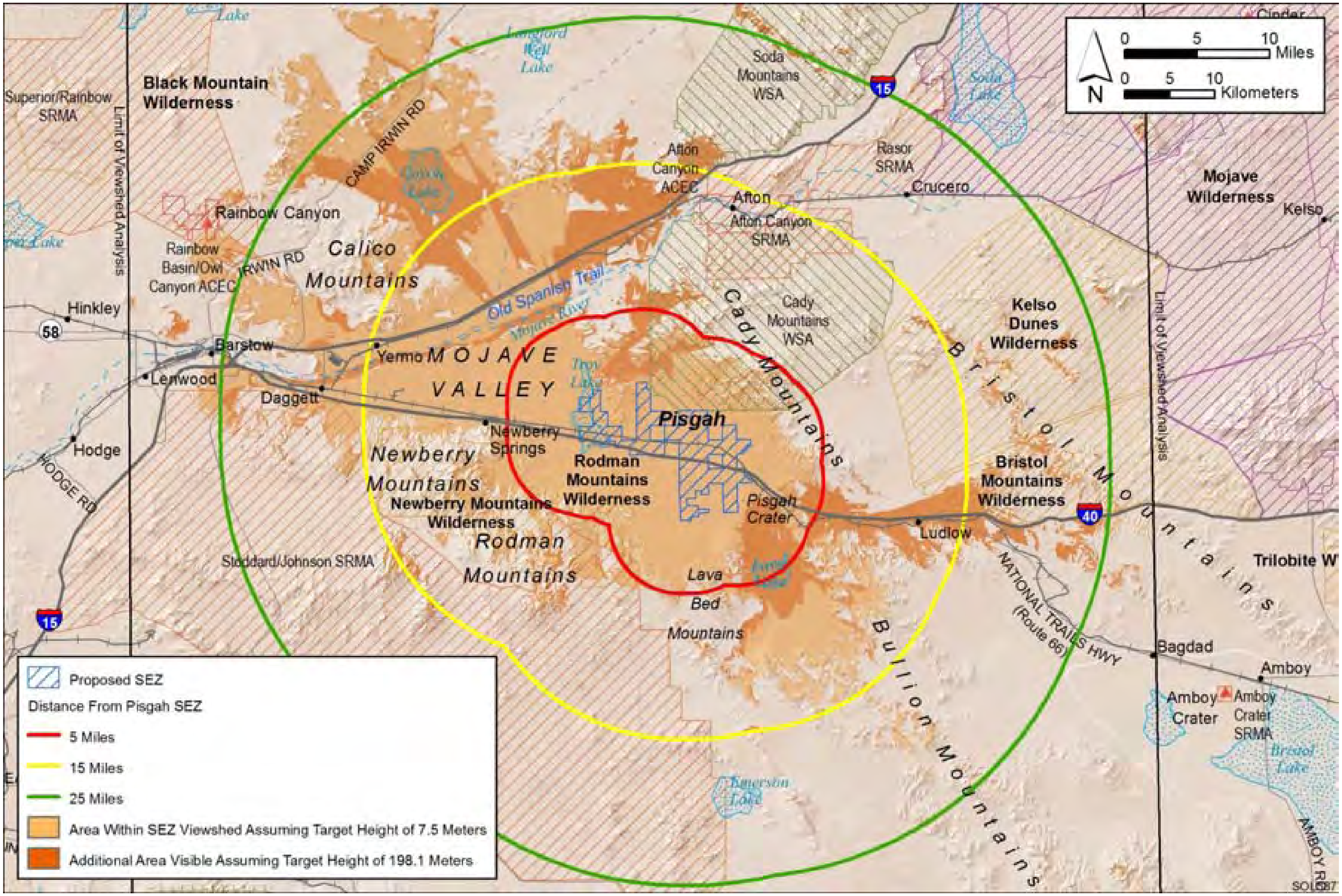

FIGURE 9.3.14.2-2 Overlay of Selected Sensitive Visual Resource Areas onto Combined 650-ft (197.1-m) and 24.6-ft (7.5-m) Viewsheds for the Proposed Pisgah SEZ

Potential impacts on specific sensitive resource areas visible from and within 25 mi (40 km) of the proposed Pisgah SEZ are discussed below. The results of this analysis are also summarized in Table 9.3.14.2-1. Further discussion of impacts on these areas is available in Sections 9.3.3 (Specially Designated Areas and Lands with Wilderness Characteristics) and 9.3.17 (Cultural Resources) of this PEIS.

The following visual impact analysis describes *visual contrast levels* rather than *visual impact levels*. *Visual contrasts* are changes in the seen landscape, including changes in the forms, lines, colors, and textures of objects seen in the landscape. A measure of *visual impact* includes potential human reactions to the visual contrasts arising from a development activity, based on viewer characteristics, including attitudes and values, expectations, and other

TABLE 9.3.14.2-1 Selected Potentially Affected Sensitive Visual Resources within a 25-mi (40.2-km) Viewshed of the Proposed Pisgah SEZ, Assuming a Viewshed Analysis Target Height of 650 ft (198.1 m)

		Feature Area or Linear Distance[a]		
			Visible between	
Feature Type	Feature Name and Total Acreage	Visible within 5 mi	5 and 15 mi	15 and 25 mi
National Conservation Area	California Desert Conservation Area (25,919,319 acres)	178,231 acres (0.7%)[b]	228,302 acres (0.9%)	145,805 acres (0.6%)
National Historic Trail	Old Spanish	0 acres	33.2 mi	3.8 mi
WAs	Bristol Mountains (77, 026 acres)	0 acres	1,776 acres (2.3%)	6,577 acres (8.5%)
	Kelso Dunes (154,335 acres)	0 acres	694 acres (0.4%)	3,689 acres (2.4%)
	Newberry Mountains (27,768 acres)	0 acres	6,498 acres (23.4%)	0 acres
	Rodman Mountains (34,341 acres)	9,120 acres (26.6%)	10,780 acres (31%)	0 acres
WSAs	Cady Mountains (120,197 acres)	20,677 acres (17.2%)	3,275 acres (3%)	0 acres
	Soda Mountains (121,680 acres)	0 acres	0 acres	3,005 acres (2.5%)

[a] To convert acres to km^2, multiply by 0.004047; to convert mi to km, multiply by 1.609.

[b] Percentage of total feature area for areal features.

characteristics that are viewer- and situation-specific. Accurate assessment of visual impacts requires knowledge of the potential types and numbers of viewers for a given development and their characteristics and expectations; specific locations from which the project might be viewed; and other variables that were not available or not feasible to incorporate in the PEIS analysis. These variables would be incorporated into a future site-and project-specific assessment that would be conducted for specific proposed utility-scale solar energy projects. For more discussion of visual contrasts and impacts, see Section 5.12 of the PEIS.

National Conservation Areas

- *California Desert Conservation Area*—The California Desert Conservation Area (CDCA) is a 26-million-acre (105,000-km^2) parcel of land in southern California designated by Congress in 1976 through the FLPMA. About 10 million acres (40,000 km^2) of the CDCA are administered by the BLM). The proposed Pisgah SEZ is located within the CDCA.

  Portions of the CDCA within the 650-ft (198.1-m) viewshed for the Pisgah SEZ include approximately 552,338 acres (2,235 km^2), or 2.1% of the total CDCA acreage. Portions of the CDCA within the 24.6-ft (7.5-m) viewshed encompass approximately 361,194 acres (1,462 km^2), or 1.4% of the total CDCA acreage.

  The CDCA management plan notes the "superb variety of scenic values" in the CDCA (BLM 1999) and lists scenic resources as needing management to preserve their value for future generations. The CDCA management plan divides CDCA lands into multiple-use classes based on management

GOOGLE EARTH™ VISUALIZATIONS

The visual impact analysis discussion in this section utilizes three-dimensional Google Earth™ perspective visualizations of hypothetical solar facilities placed within the SEZ. The visualizations include simplified wireframe models of a hypothetical solar power tower facility. The models were placed at various locations within the SEZ as visual aids for assessing the approximate size and viewing angle of utility-scale solar facilities. The visualizations are intended to show the apparent size, distance, and configuration of the SEZ, as well as the apparent size of a typical utility-scale solar power tower project and its relationship to the surrounding landscape, as viewed from potentially sensitive visual resource areas within the viewshed of the SEZ.

The visualizations are not intended to be realistic simulations of the actual appearance of the landscape or of proposed utility-scale solar energy projects. The placement of models within the SEZ did not reflect any actual planned or proposed projects within the SEZ, and did not take into account engineering or other constraints that would affect the siting or choice of facilities for this particular SEZ. The number of facility models placed in the SEZ does not reflect the 80% development scenario analyzed in the PEIS, but it should be noted that the discussion of expected visual contrast levels does account for the 80% development scenario. A solar power tower was chosen for the models because the unique height characteristics of power tower facilities make their visual impact potential extend beyond other solar technology types.

objectives. The class designations govern the type and degree of land use actions allowed within the areas defined by class boundaries. All land use actions and resource-management activities on public lands within a multiple-use class delineation must meet the guidelines given for that class.

The proposed SEZ is within areas classified as multiple-use classes “L” and “M.” Class “L” protects sensitive, natural, scenic, ecological, and cultural resource values. Class “L” management provides for generally lower intensity, carefully controlled multiple use of resources, while ensuring that sensitive values are not significantly diminished. The area of the SEZ below I-40 is designated as Class “L.” Multiple-Use Class “M” (Moderate Use) is based upon a controlled balance between higher intensity use and protection of public lands. This class provides for a wide variety of present and future uses such as mining, livestock grazing, recreation, energy, and utility development. Class “M” management is also designed to conserve desert resources and to mitigate damage to those resources which permitted uses may cause.

Utility-scale solar development within the SEZ would be an allowable use under the CDCA management plan, assuming NEPA requirements were met and mitigation measures were used to minimize visual impacts. However, construction and operation of solar facilities under the PEIS development scenario would result in substantial visual impacts on the SEZ and some surrounding lands within the SEZ viewshed that could not be completely mitigated.

Wilderness Areas

- *Bristol Mountains*—The 77,026-acre (312-km^2) Bristol Mountains WA is a congressionally designated WA located 11.9 mi (19.2 km) at the point of closest approach east of the SEZ. The trail-less WA contains the tilted volcanic plain called Old Dad Mountains and the northern portion of the Bristol Mountains. The terrain is rolling and consists of volcanic uplands. The broad Budweiser Wash drains into the eastern portion of the wilderness. Hiking, horseback riding, hunting, camping, rock hounding, photography, and backpacking are recreational activities within the wilderness.

  Portions of the WA within the 650-ft (198.1-m) SEZ viewshed (approximately 8,353 acres [33.8 km^2], or 10.8% of the total WA acreage) extend from the point of closest approach at the eastern boundary of the SEZ to approximately 16 mi (26 km) from the SEZ. Approximately 775 acres (3 km^2) of the WA are within the 24.6-ft (7.5-m) SEZ viewshed.

  As shown in Figure 9.3.14.2-2, the viewshed analysis indicates that the upper western slopes and peaks of the highest mountains in the Bristol Mountains

WA would have views of the southeastern portion of the SEZ; however, in most of the WA, views of the SEZ would be almost completely screened by the Cady Mountains, and only the tops of tall power towers at certain locations within the SEZ could potentially be seen. If the receivers of operating power towers were visible within the SEZ, they would likely appear as points of light just above the western horizon. If sufficiently tall, power towers could have red or white flashing hazard navigation lights that could be visible from the WA at night. From scattered locations within the SEZ, portions of lower-height facilities could potentially be seen, but these areas would occupy very small portions of the horizontal field of view, and the viewing angle would be low. Primarily because of the near complete screening of the SEZ, under the 80% development scenario analyzed in the PEIS, expected visual contrast levels from solar facilities in the SEZ would be expected to be minimal to weak for viewpoints in the Bristol Mountains WA.

- *Kelso Dunes*—The 154,335-acre (625-km^2) Kelso Dunes WA is located approximately 12 mi (19 km) east of the SEZ at the point of closest approach. A small portion of the WA (approximately 4,383 acres [18 km^2], or 2.8% of the total WA acreage) is within the 650-ft (197.1-m) viewshed of the SEZ. The area within the viewshed extends 17 mi (27 km) from the point of closest approach at the eastern boundary of the SEZ to approximately 24 mi (38 km) from the SEZ. None of the WA is visible within the lower-height viewsheds.

  The western portion of the WA includes parts of the Bristol Mountains, and the viewshed analysis indicates that the western slopes and peaks of some of the Bristol Mountains within the WA could have views of the upper portions of power towers within the eastern portion of the SEZ. At a distance of 16.5 mi (26.6 km) to approximately 24 mi (38 km), the light from power towers receivers would likely appear as distant points of light on the western horizon. Only very small portions of the SEZ would be visible from the WA, and the affected area within the WA is small, so impacts on the WA from solar energy development within the SEZ are expected to be minimal.

- *Newberry Mountains*—The 27,768-acre (112-km^2) Newberry Mountains WA is located approximately 6 mi (10 km) west of the SEZ at the point of closest approach. The Newberry Mountains WA is known for its rugged, generally flat-topped volcanic mountains and deep, maze-like canyons. Elevations range from 2,200 ft (671 m) in the north to 5,100 ft (1,554 m) in the south.

  Solar energy facilities within the SEZ could be visible from the eastern slopes of the Newberry Mountains within the WA, and from scattered peaks in the western portion of the WA as well. Portions of the WA within the 650-ft (198.1-m) viewshed (approximately 6,498 acres [26 km^2], or 23% of the total WA acreage) extend from the point of closest approach at the western boundary of the SEZ to approximately 10 mi (16 km) from the SEZ.

Approximately 5,349 acres (22 km^2) of the WA are within the 24.6-ft (7.5-m) SEZ viewshed.

Figure 9.3.14.2-3 is a three-dimensional Google Earth™ perspective visualization of the SEZ (highlighted in orange) as seen from an unnamed peak (elevation approximately 4,800 ft [1,500 m]) in the east-central portion of the WA, approximately 9 mi (15 km) from the southwest corner of the SEZ, and approximately 3,000 ft (900 m) above the valley floor. The visualization includes simplified wireframe models of a hypothetical solar power tower facility. The models were placed within the SEZ as a visual aide for assessing the approximate size and viewing angle of utility-scale solar facilities. The receiver towers depicted in the visualization are properly scaled models of a 459-ft (139.9-m) power tower with an 867-acre (3.5-km^2) field of 12-ft (3.7-m) heliostats, each representing approximately 100 MW of electric generating capacity. Ten models were placed in the SEZ for this and other visualizations shown in this section of the PEIS. In the visualization, the SEZ area is depicted in orange, the heliostat fields in blue.

The upper slopes and peaks of the Newberry Mountains are barren with little opportunity for screening. I-40, Route 66, agricultural fields, and other cultural disturbances would be visible west of the SEZ and in the southern portion of the SEZ. While the presence of these existing disturbances might tend to lessen the contrast associated with the introduction of solar facilities into the viewshed, the scale and strong geometry of the solar facilities would be such that any reduction of contrast would be slight.

As shown in the visualization, the entire SEZ is visible from this location, although the angle of view is low. The SEZ would occupy much of the horizontal field of view. At the higher elevations within the WA, the angle of view is great enough that the tops of collector/reflector arrays for solar facilities within the SEZ might be visible in the closer portions of the SEZ, which would make their large areal extent and regular geometry more apparent, tending to increase associated visual contrasts. At lower elevations within the WA, the angle of view is lower, so solar collector/reflector arrays would be seen nearly edge-on, their size and regular geometry would be less apparent, and they would appear to repeat the line of the plain in which the SEZ is located, tending to reduce contrast.

Tall power towers, power blocks, plumes, and transmission towers located in the nearest parts of the SEZ would add very short oblique and vertical lines and form elements that would likely project above the solar collector/reflector arrays and tend to increase visual contrast. In the farthest portions of the SEZ, these elements might be visible but might not attract the attention of casual viewers.

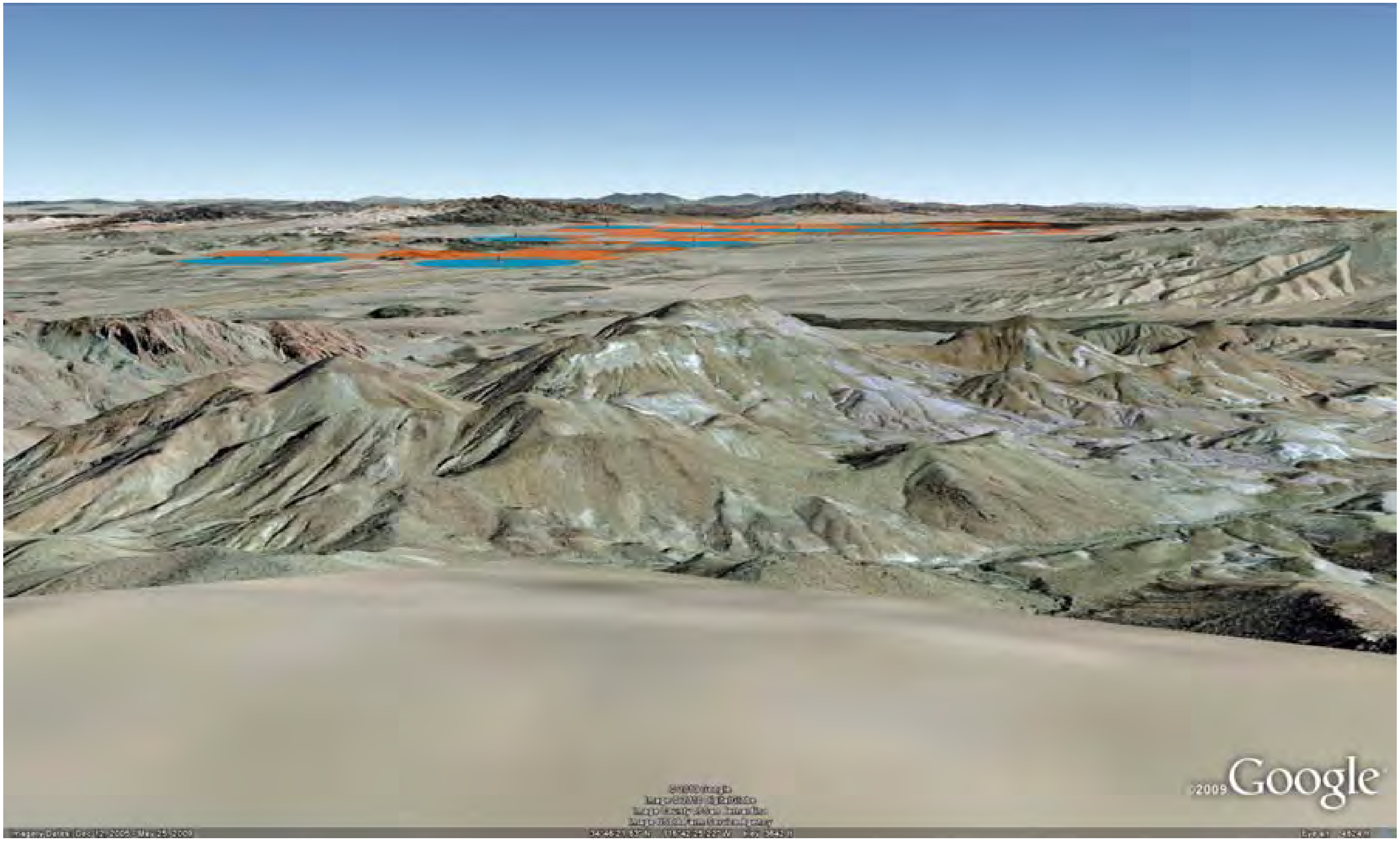

FIGURE 9.3.14.2-3 Google Earth Visualization of the Proposed Pisgah SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from a Peak in the Newberry Mountains Wilderness

If power towers were present in the closer portions of the SEZ, when operating, the receivers would likely appear as bright lights atop discernable tower structures against the backdrop of the valley floor, while for power towers in the more distant sections of the SEZ, the receivers would likely appear as distant points of light against the backdrop of the valley floor, or possibly the Cady Mountains, depending on viewing angle and facility location.

If sufficiently tall, the power towers could have red or white flashing hazard navigation lights that would likely be visible from the WA at night, and could be conspicuous from this viewpoint, given the dark night skies in the vicinity of the SEZ. Other lighting associated with solar facilities in the SEZ could potentially be visible as well, at least for facilities in the closest portions of the SEZ.

The nature of the visual contrasts from solar facilities in the SEZ as observed from this location would depend on the numbers, types, sizes and locations of solar facilities in the SEZ, and other project- and site-specific factors. Under the 80% development scenario analyzed in this PEIS, solar facilities within the SEZ would be expected to create moderate visual contrasts as seen from this viewpoint.

In general, the range of visual contrasts from solar facilities within the SEZ that would be experienced by WA visitors would be highly dependent on viewer location within the WA, as well as the numbers, types, sizes and locations of solar facilities in the SEZ, and other project- and site-specific factors. Under the 80% development scenario analyzed in this PEIS, solar facilities within the SEZ would be expected to create weak to moderate visual contrasts as viewed from the WA. The highest levels of visual contrast would be expected for viewing locations at higher elevations in the far eastern portion of the WA, with less visibility and lower contrast levels expected at lower elevations and/or more distant locations.

- *Rodman Mountains*—The 34,341-acre (139-km^2) Rodman Mountains WA is located approximately 1.2 mi (1.9 km) southwest of the SEZ at the point of closest approach. The Rodman Mountains reach elevations of 5,000 ft (1,524 m), and the WA contains deep canyons and wide washes cutting through mountain ridges and sloping bajadas that descend from the central core of peaks.

  As shown in Figure 9.3.14.2-2, the SEZ is visible from more than half of the WA, particularly the northern and eastern portions; however, visibility extends to the southern and western boundaries of the WA in some areas. Portions of the WA within the 650-ft (198.1-m) viewshed (approximately 19,900 acres [81 km^2], or 57.9% of the total WA acreage) extend from the point of closest approach at the eastern boundary of the SEZ to approximately

9 mi (15 km) from the SEZ. Visible portions extend up to 5 mi (7 km) from the northern boundary of the SEZ. Approximately 17,347 acres (70 km^2) of the WA are within the 24.6-ft (7.5-m) SEZ viewshed.

Figure 9.3.14.2-4 is a Google Earth visualization of the SEZ (highlighted in orange) as seen from an unnamed peak (elevation approximately 4,300 ft [1,300 m]) in the north-central portion of the WA, approximately 6 mi (10 km) from the southwest corner of the SEZ, and approximately 2,500 ft (760 m) above the valley floor. The nearest power tower in the visualization (at left) is about 6.5 mi (10.5 km) from the viewpoint. The SEZ area is depicted in orange, the heliostat fields in blue.

The upper slopes and peaks of the Rodman Mountains are barren, with little opportunity for screening. I-40, Route 66, agricultural fields, and other cultural disturbances would be visible west of the SEZ, and in the southern portion of the SEZ. While the presence of these existing disturbances might tend to lessen the contrast associated with the introduction of solar facilities into the viewshed, the scale and strong geometry of the solar facilities would be such that any reduction of contrast would be slight.

The visualization suggests that from this elevated viewpoint, under the 80% development scenario analyzed in the PEIS, solar facilities in the SEZ would fill the horizontal field of view. The tops of solar collector/reflector arrays in the closest parts of the SEZ would be visible, which would make their large areal extent and strong regular geometry more apparent, tending to increase contrast. The angle of view would be low enough that visible solar collector/reflector arrays in the northeast portion of the SEZ (farthest away from this viewpoint) would be seen nearly edge-on, which would tend to reduce contrast.

Taller ancillary facilities, such as buildings, transmission structures, and cooling towers; and plumes (if present) could be visible projecting above the collector/reflector arrays, at least for nearby facilities. The ancillary facilities could create form and line contrasts with the strongly horizontal, regular, and repeating forms and lines of the collector/reflector arrays.

If power towers were present within the closer parts of the SEZ, when operating, the receivers would likely appear as very bright points of light atop discernable tower structures, against the backdrop of the valley floor. If sufficiently tall, the power towers could have red or white flashing hazard navigation lights that would likely be visible from the WA at night, and could be conspicuous from this viewpoint, although other lights would be visible in the vicinity of the SEZ. Other lighting associated with solar facilities in the SEZ could potentially be visible as well, at least for facilities in the closest portions of the SEZ.

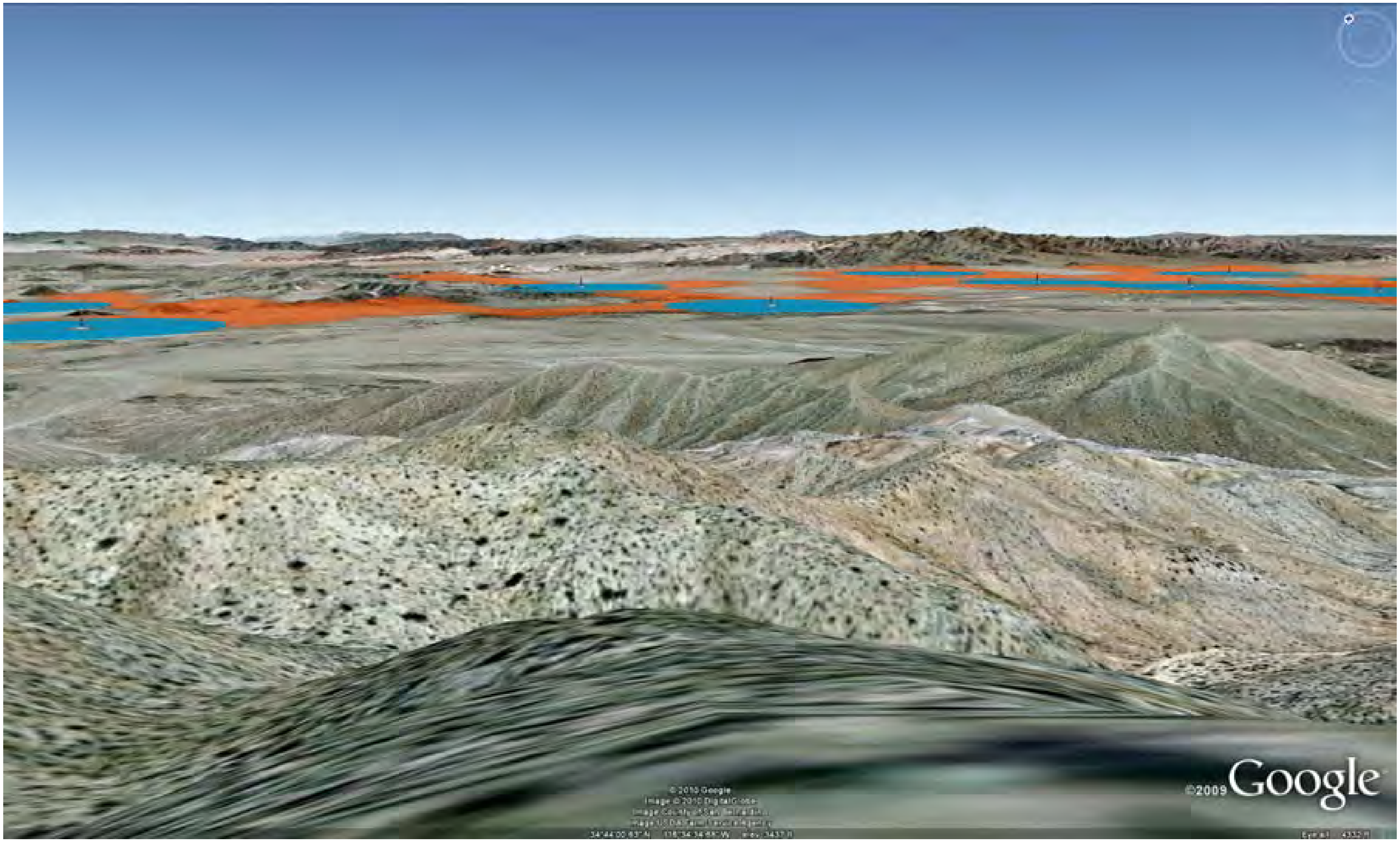

FIGURE 9.3.14.2-4 Google Earth Visualization of the Proposed Pisgah SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from a Peak in the Rodman Mountains Wilderness

The nature of the visual contrasts from solar facilities in the SEZ as observed from this location would depend on the numbers, types, sizes, and locations of solar facilities in the SEZ, and other project- and site-specific factors. Under the 80% development scenario analyzed in this PEIS, solar facilities within the SEZ would be expected to create moderate visual contrasts as seen from this viewpoint.

Figure 9.3.14.2-5 is a Google Earth visualization of the SEZ (highlighted in orange) as seen from an unnamed hill (elevation approximately 3,000 ft [900 m]) in the northeastern portion of the WA, approximately 4 mi (6 km) from the nearest point in the SEZ, and approximately 1,200 ft (370 m) above the valley floor. The nearest power tower in the visualization (at left) is about 5.0 mi (8.0 km) from the viewpoint. This distance is within the BLM VRM Program's 3 to 5 mi (5 to 8 km) foreground-middleground distance.

The viewpoint area lacks vegetation dense or tall enough for screening. From this viewpoint, I-40, Route 66, agricultural fields, and other cultural disturbances would be visible in the southern portion of the SEZ. While the presence of these existing disturbances might tend to lessen the contrast associated with the introduction of solar facilities into the viewshed, the scale and strong geometry of the solar facilities would be such that any reduction of contrast would be slight.

The visualization suggests that from this elevated viewpoint, the SEZ would be too large to be encompassed in one view, and viewers would need to turn their heads to scan across the whole SEZ. The tops of solar collector/reflector arrays in the closest parts of the SEZ would be visible, which would make their large areal extent and strong regular geometry more apparent,, tending to increase contrast. The angle of view would be low enough that visible solar collector/reflector arrays in the northeast portion of the SEZ (farthest away from this viewpoint) would be seen more nearly edge-on, which would tend to reduce contrast.

Taller ancillary facilities, such as buildings, transmission structures, and cooling towers; and plumes (if present) would likely be visible projecting above the collector/reflector arrays, at least for nearby facilities. The ancillary facilities could create form and line contrasts with the strongly horizontal, regular, and repeating forms and lines of the collector/reflector arrays. Color and texture contrasts would also be possible, but their extent would depend on the materials and surface treatments utilized in the facilities.

If power towers were present within the SEZ, when operating, the receivers would likely appear as very bright points of light against the backdrop of the valley floor or the bajadas of the Cady Mountains. If sufficiently tall, the power towers could have red or white flashing hazard navigation lights that would likely be visible from the WA at night, and could be conspicuous from

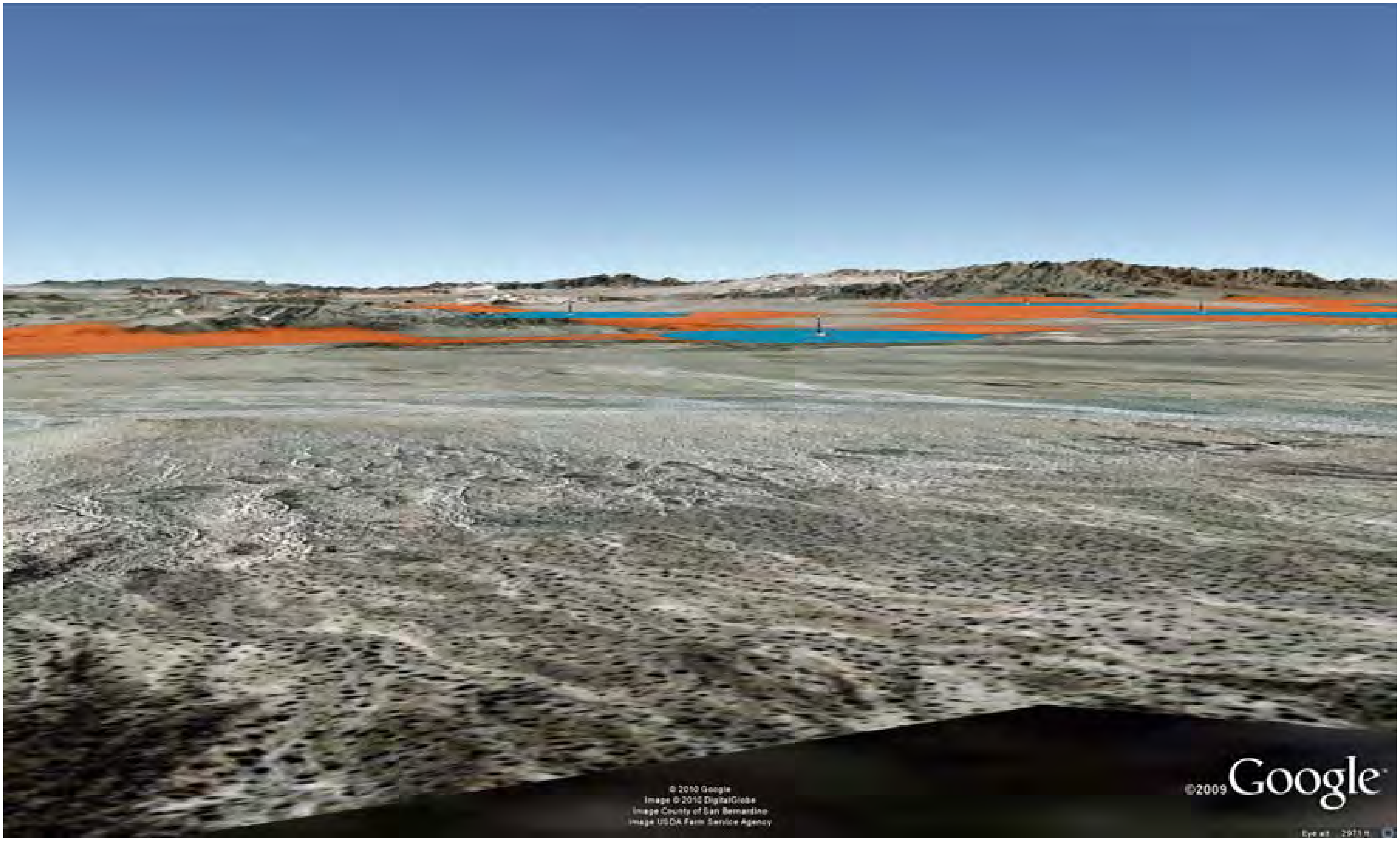

FIGURE 9.3.14.2-5 Google Earth Visualization of the Proposed Pisgah SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from a Hill in the Rodman Mountains Wilderness

this viewpoint, although other lights would be visible in the vicinity of the SEZ. Other lighting associated with solar facilities in the SEZ could potentially be visible as well, at least for facilities in the closest portions of the SEZ.

The potential visual contrast expected for this viewpoint would vary depending on the numbers, types, sizes, and locations of solar facilities in the SEZ, and other project- and site-specific factors, but under the 80% development scenario analyzed in this PEIS, solar facilities within the SEZ would be expected to create strong visual contrasts as viewed from this location within the WA.

In summary, the Rodman Mountains WA is very close to the SEZ, and many locations within the WA could have clear views of solar facilities in the SEZ across much of the field of view to the northeast of the WA. Given that there could be numerous solar facilities within the SEZ, with a variety of technologies employed, and a range of supporting facilities that would contribute to visual impacts, such as transmission towers and lines, substations, power block components, and roads, the resulting visually complex landscape would be essentially industrial in appearance and would contrast greatly with the surrounding more natural-appearing landscape. Under the 80% development scenario analyzed in the PEIS, strong levels of visual contrast from solar facilities within the SEZ could be observed from many locations within the WA, especially from elevated viewpoints.

Wilderness Study Areas

- *Soda Mountains*—The Soda Mountains WSA is located 15 mi (25 km) north of the SEZ at the point of closest approach and encompasses 121,680 acres (492 km^2). The topography of the WSA varies from several gently sloping bajadas to the rugged Soda Mountains. This highly eroded mountain range has jagged ridges and sharp peaks that reach 3,663 ft (1,116 m) in elevation.

  The area of the WSA within the 650-ft (198.1-m) viewshed of the SEZ includes 3,005 acres (12.2 km^2), or 2.5% of the total WSA acreage. None of the WA is visible within the lower-height viewsheds. The visible area extends from the point of the closest approach from the northernmost boundary of the SEZ to approximately 18 mi (29 km) from the SEZ.

  The viewshed analysis indicates that the far southwest portion of the Soda Mountains WSA and the highest mountains in the central portion of the WSA could have views of solar facilities in the far western portions of the SEZ. The Cady Mountains screen views of most of the SEZ from locations in the WSA. However, where views of the SEZ existed, because of the long distance to the

SEZ and the low angle of view, visual contrasts seen from the WSA would be expected to be minimal.

- *Cady Mountains*—The Cady Mountains WSA is located directly adjacent to the SEZ on the central northern boundary and encompasses 120,197 acres (486 km^2). Within the center of the WSA, and completely surrounded by the mountains, is the large, broad area known as Hidden Valley. Major peaks within the Cady Mountains include Cady Peak and Sleeping Beauty, at the southern end of the range (also known as the Sleeping Beauty Mountains). The Cady Peak summit is at an elevation of 4,627 ft (1,410 m). A number of four-wheel drive roads provide access to the WSA.

  The area of the WSA within the 650-ft (198.1-m) viewshed of the SEZ includes 23,952 acres (97 km^2), or 19.9% of the total WSA acreage. The area within the 24.6-ft (7.5-m) viewshed of the SEZ includes 16,056 acres (65 km^2), or 13.4% of the total WSA acreage. The area of the WSA with potential visibility of solar facilities in the SEZ extends from the northeast corner of the SEZ to approximately 6 mi (9 km) from the SEZ.

  Figure 9.3.14.2-6 is a Google Earth visualization of the SEZ (highlighted in orange) as seen from Cady Peak (elevation 4,627 ft [1,410 m]) in the south-central portion of the WSA, approximately 5 mi (7 km) from the closest point in the SEZ, and approximately 2,600 ft (790 m) above the valley floor. The nearest power tower in the visualization (at left) is about 6.1 mi (9.8 km) from the viewpoint.

  The visualization suggests that from this elevated viewpoint, under the 80% development scenario analyzed in the PEIS, solar facilities within the SEZ would nearly fill the horizontal field of view. The tops of solar collector/reflector arrays in the SEZ would be visible, which would make their large areal extent and strong regular geometry more apparent, increasing visual contrasts.

  Taller ancillary facilities, such as buildings, transmission structures, and cooling towers; and plumes (if present) would likely be visible projecting above the collector/reflector arrays, at least for nearby facilities. The ancillary facilities could create form and line contrasts with the strongly horizontal, regular, and repeating forms and lines of the collector/reflector arrays. Color and texture contrasts would also be possible, but their extent would depend on the materials and surface treatments utilized in the facilities.

  If power towers were present within the SEZ, when operating, the receivers would likely appear as bright points of light against the backdrop of the valley floor. If sufficiently tall, the power towers could have red or white flashing hazard navigation lights that would likely be visible from the WSA at night, and could be conspicuous from this viewpoint, although other lights would be

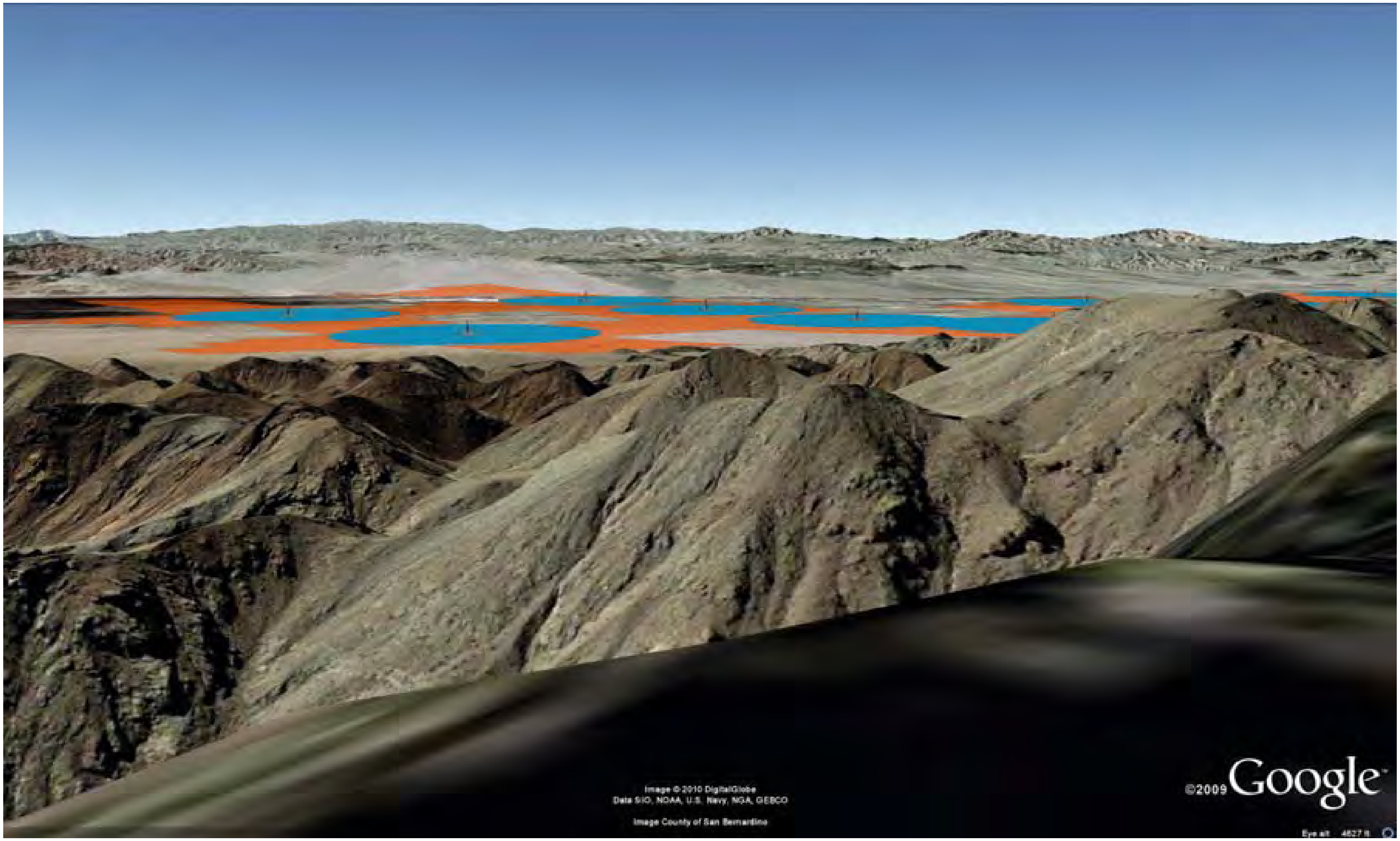

FIGURE 9.3.14.2-6 Google Earth Visualization of the Proposed Pisgah SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from Cady Peak in the Cady Mountains WSA

visible in the vicinity of the SEZ. Other lighting associated with solar facilities in the SEZ could potentially be visible as well, at least for facilities in the closest portions of the SEZ.

The potential visual contrast expected for this viewpoint would vary depending on the numbers, types, sizes, and locations of solar facilities in the SEZ, and other project- and site-specific factors, but under the 80% development scenario analyzed in this PEIS, solar facilities within the SEZ would be expected to create strong visual contrasts as viewed from this location within the WSA.

Figure 9.3.14.2-7 is a Google Earth visualization of the SEZ (highlighted in orange) as seen from an unnamed hill (elevation 2,626 ft [1,410 m]) in the far western portion of the WSA, approximately 3 mi (5 km) from the closest point in the SEZ, and approximately 600 ft (180 m) above the valley floor. The nearest power tower in the visualization (at right) is about 5.6 mi (9.0 km) from the viewpoint.

The visualization suggests that views of the SEZ would be partially screened by intervening terrain within the WSA; however, the SEZ and solar facilities within the SEZ would still likely occupy a substantial portion of the horizontal field of view. Solar facilities visible within the SEZ would be seen nearly edge-on, so that the collector/reflector arrays would tend to repeat the line of the horizon, and their apparent size would be reduced, which would tend to reduce contrast; however, taller ancillary facilities, such as buildings, transmission structures, and cooling towers; and plumes (if present) would likely be visible projecting above the collector/reflector arrays, at least for nearby facilities. The ancillary facilities could create form and line contrasts with the strongly horizontal, regular, and repeating forms and lines of the collector/reflector arrays.

If power tower receivers were located within the SEZ, when operating, they would likely appear as very bright point-like or nearly point-like light sources against the bajadas of the Rodman Mountains. If sufficiently tall, the power towers could have red or white flashing hazard navigation lights that would likely be visible from the WSA at night, and could be conspicuous from this viewpoint, although other lights would be visible in the vicinity of the SEZ. Other lighting associated with solar facilities in the SEZ could potentially be visible as well, at least for facilities in the closest portions of the SEZ.

Even though the viewpoint is close to the SEZ, solar facilities would be partially screened by topography, and in addition the vertical angle of view to solar facilities in the SEZ would be low. As a result, from this viewpoint, under the 80% development scenario analyzed in the PEIS, solar energy

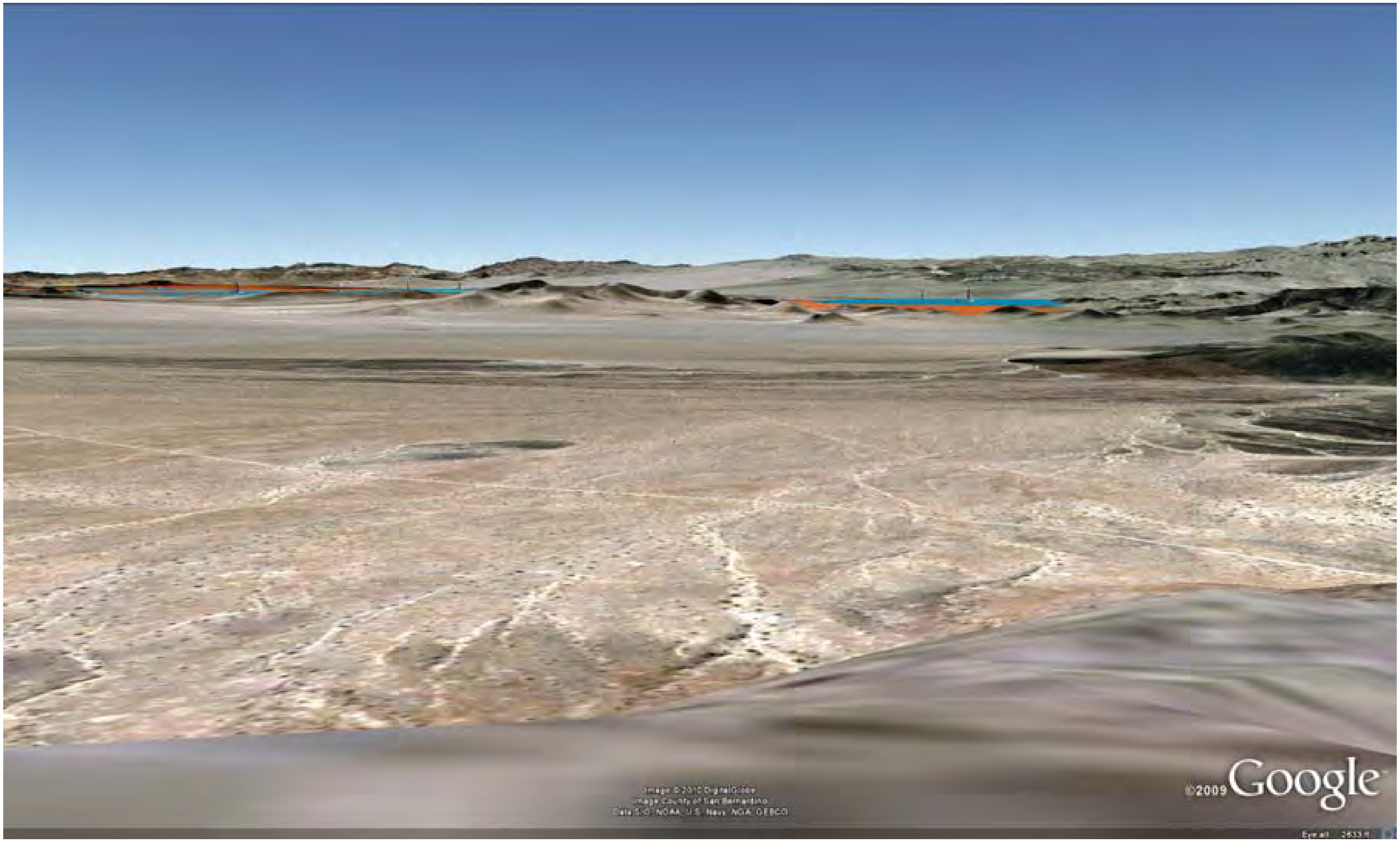

FIGURE 9.3.14.2-7 Google Earth Visualization of the Proposed Pisgah SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from a Hill in the Far Western Portion of the Cady Mountains WSA

development within the SEZ would be expected to create moderate visual contrasts.

Figure 9.3.14.2-8 is a Google Earth visualization of the SEZ (highlighted in orange) as seen from an unnamed hill (elevation 4,627 ft [1,410 m]) in the southern portion of the WSA, approximately 0.5 mi (0.8 km) from the closest point in the SEZ, and approximately 500 ft (150 m) above the valley floor. The closest power tower in the visualization is about 1.3 mi (2.0 km) from the viewpoint.

The visualization suggests that from this elevated viewpoint, the SEZ would be too large to be encompassed in one view, and viewers would need to turn their heads to scan across the whole SEZ. Solar energy facilities within the closest portions of the SEZ would occupy much of the field of view looking out over the valley, and would be expected to dominate views in that direction. The tops of nearby solar collector/reflector arrays in the nearer portions of the SEZ would be visible, which would make their large areal extent and strong regular geometry more apparent, tending to increase contrast. Facilities farther from the viewpoint would be seen at a lower viewing angle and would therefore exhibit reduced contrast levels.

Taller ancillary facilities, such as buildings, transmission structures, and cooling towers; and plumes (if present) would likely be visible projecting above the collector/reflector arrays. The ancillary facilities could create strong form and line contrasts with the strongly horizontal, regular, and repeating forms and lines of the collector/reflector arrays. Color and texture contrasts would also be likely, at least for facilities close to the viewpoint, but their extent would depend on the materials and surface treatments utilized in the facilities.

If power tower receivers were located in the nearest portions of the SEZ, when operating, they would likely appear as brilliant nonpoint (i.e. having a cylindrical or rectangular surface area) light sources projecting above the collector/reflector arrays along the horizon line, and would likely strongly attract visual attention, as seen from this viewpoint. In addition, during certain times of the day from certain angles, sunlight on dust particles in the air might result in the appearance of light streaming down from the tower(s).

If sufficiently tall, the power towers could have red or white flashing hazard navigation lights that would likely be visible from the WSA at night, and would likely be very conspicuous from this viewpoint, although other lights would be visible in the vicinity of the SEZ. Other lighting associated with solar facilities in the SEZ would likely be visible as well, at least for facilities in the closest portions of the SEZ.

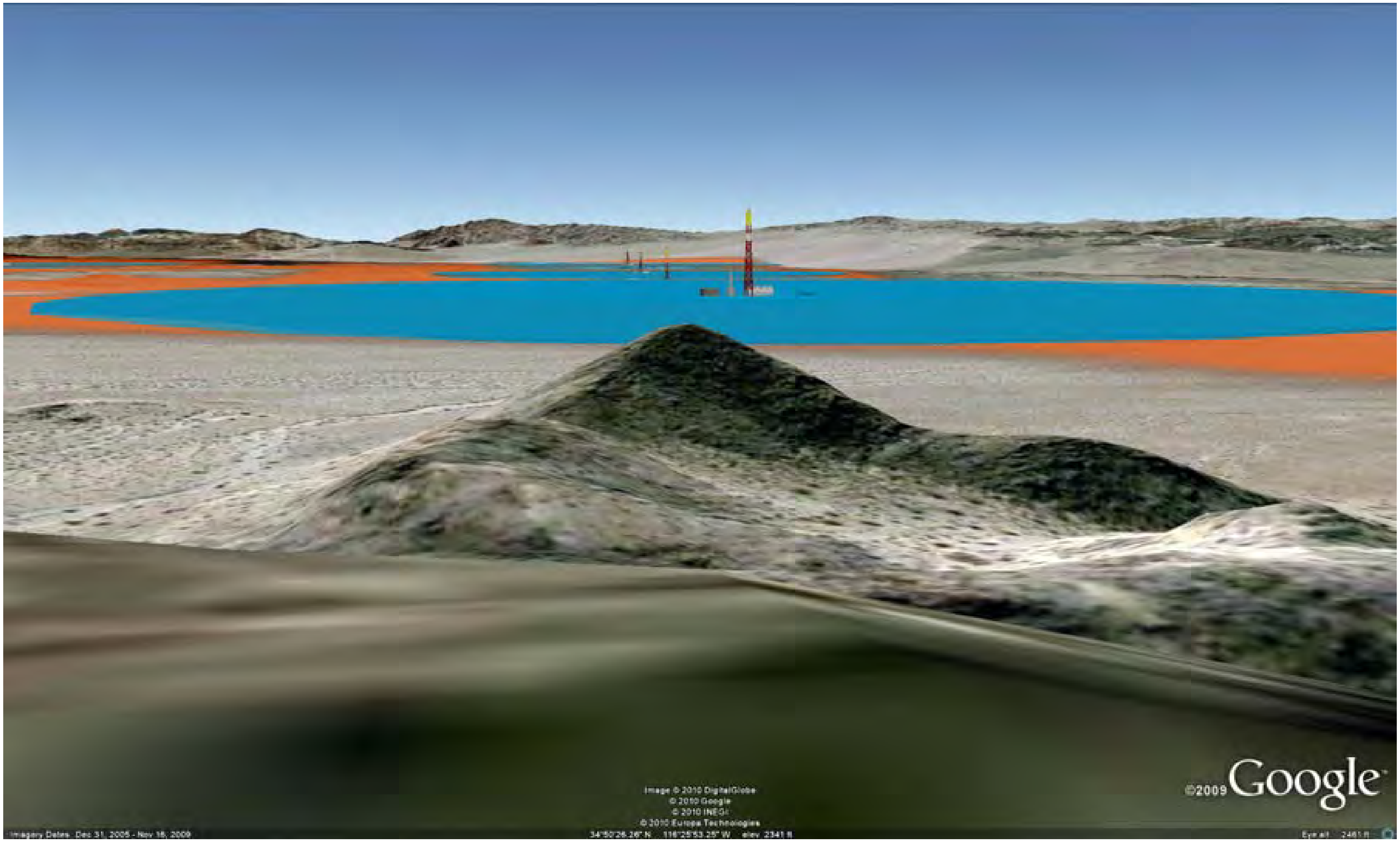

FIGURE 9.3.14.2-8 Google Earth Visualization of the Proposed Pisgah SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from a Hill in the Southern Portion of the Cady Mountains WSA

The elevated viewpoint would make the very regular geometry of nearby solar collector/reflector arrays apparent, structural details of facility components could be visible, and power tower receivers and other tall solar facility components (e.g., associated transmission towers) could be seen in the BLM foreground-middleground distance, which would tend to increase visual contrast. From this elevated viewpoint, and with the short distance to the SEZ, under the 80% development scenario analyzed in the PEIS, solar energy development within the SEZ would be expected to create strong visual contrasts.

In summary, portions of the Cady Mountains WSA border the SEZ, and many locations within the WSA could have clear views of solar facilities in the SEZ across much of the field of view to the south and southwest of the WSA. Given that there could be numerous solar facilities within the SEZ, with a variety of technologies employed, and a range of supporting facilities that would contribute to visual impacts, such as transmission towers and lines, substations, power block components, and roads, the resulting visually complex landscape would be essentially industrial in appearance and would contrast greatly with the surrounding more natural-appearing landscape. Under the 80% development scenario analyzed in the PEIS, strong levels of visual contrast from solar facilities within the SEZ could be observed from many locations within the WSA, especially from elevated viewpoints.

National Historic Trail

- *Old Spanish*—The Old Spanish National Historic Trail is a congressionally designated multistate historic trail that passes within 6 mi (10 km) of the SEZ at the point of closest approach on the northwest side of the SEZ. Approximately 8 mi (13 km) northwest of the SEZ, the trail divides into the main Northern Route and the Armijo Route. Approximately 29 mi (46 km) of the trail are within the viewshed of the SEZ, including 6 mi (9 km) of the Armijo segment.

  Within 20 mi (32 km) of the SEZ, the trail runs generally east–west through the Mojave Valley and along the Mojave River. Where the trail divides, the main Northern Route runs in a north-south direction. The SEZ is within view of the trail for much of the area. Within the viewshed, the trail runs through alluvial plains and pediments.

  From the west, the trail enters the 25-mi (40-km) SEZ in hills just north of the community of Daggett, approximately 18 mi (29 km) west of the SEZ. In these hills, screening vegetation is absent, and the SEZ would be visible on the distant eastern horizon, but would occupy a very small portion of the field of view. Power tower receivers would come into view first, likely appearing as distant points of light on the eastern horizon. The viewing angle would be quite low, and a variety of cultural disturbances, including the SEGS 1 and 2 solar power tower and parabolic trough facilities, would be visible in the foreground. Trail users who followed the Mojave River bed just south of the hills would not likely see the SEZ until passing the SEGS facilities, at which point the upper portions of sufficiently tall power towers in the far western portion of the SEZ might appear just over the horizon, absent screening by vegetation or structures. At this long distance, the receivers of operating power towers in the SEZ would likely appear as distant points of light on the eastern horizon directly down the trail, against a sky backdrop. If sufficiently tall, the power towers could have red or white flashing hazard navigation lights that could be visible from the trail at night, although other lights would be visible in the vicinity of the SEZ.

From Daggett eastward, the trail follows the northern edge of the bed of the dry Mojave River, turning gradually northeastward, starting just south of the community of Yermo. The trail changes elevation very little and is only slightly higher than the SEZ; thus the angle of view would stay very low, and the appearance of the SEZ (and solar development within the SEZ) would change only slightly and very gradually as trail users traveled eastward on the trail.

Figure 9.3.14.2-9 is a Google Earth visualization of the SEZ (highlighted in orange) as seen from the Old Spanish National Historic Trail just south of the community of Yermo, approximately 14 mi (23 km) from the closest point in the SEZ.

The visualization suggests that at this point on the trail, only the upper portions of sufficiently tall power towers would be visible just above the eastern horizon. At this distance, the power tower receivers would appear as distant points of light on the eastern horizon, against a sky backdrop, and would be expected to create weak visual contrasts.

As the trail turns northeastward after passing south of Yermo, receivers on operating power towers in the western portion of the SEZ would gradually increase in brightness, project slightly higher over the horizon, and would gradually move to the right in the field of view. Low-height solar facilities might not be visible from some locations, and screening by vegetation or structures might wholly obscure the SEZ at some viewpoints, as in this area, the trail passes through agricultural lands, with roads, scattered residences, and other cultural disturbances typical of a rural setting, including transmission towers and lines.

At a distance of about 8 mi (14 km) from the nearest point in the SEZ, the trail forks, with the Armijo segment continuing east-northeast, while the Northern Route turns more northward and gradually climbs toward Alvord Mountain. Figure 9.3.14.2-10 is a Google Earth visualization of the SEZ (highlighted

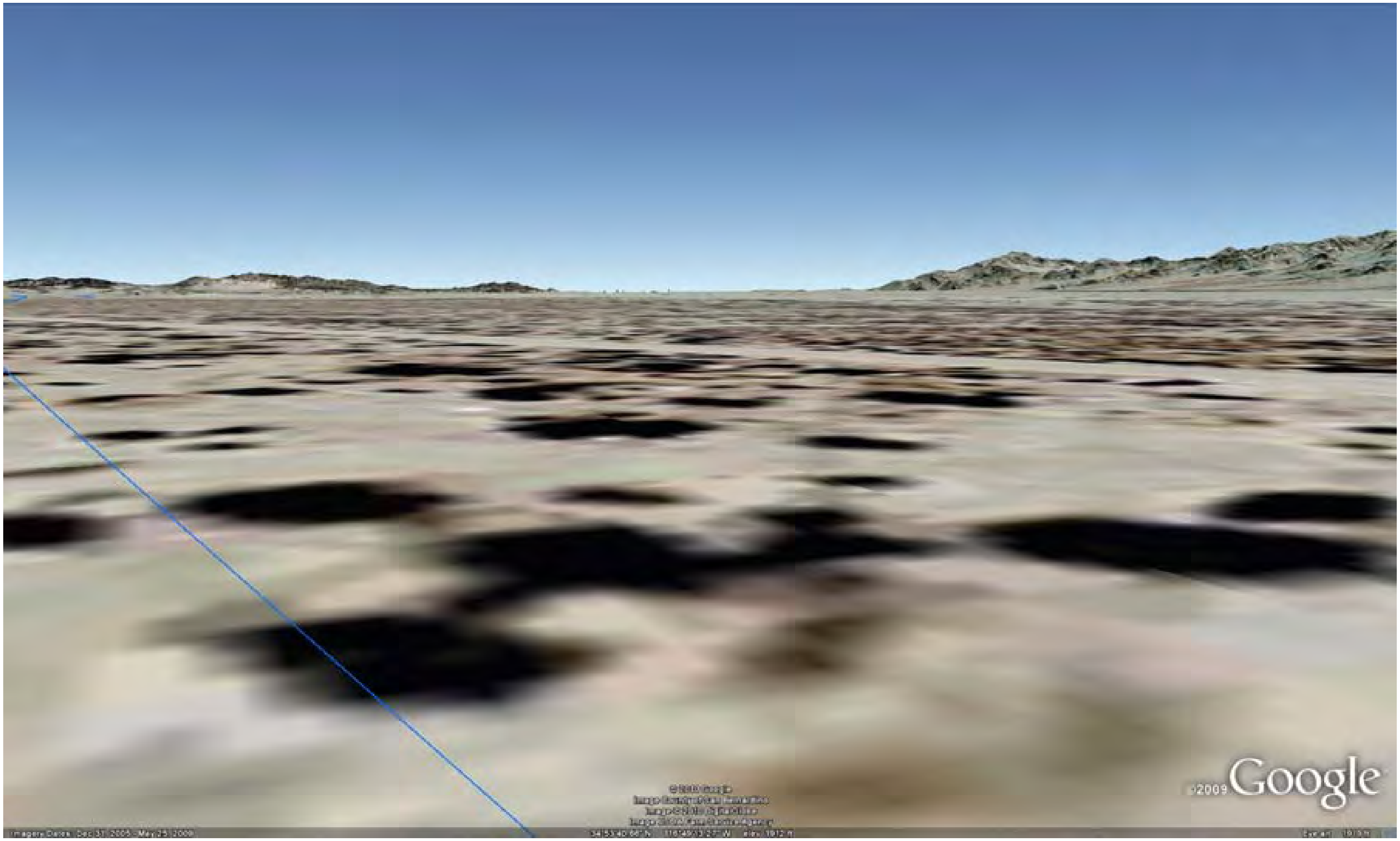

FIGURE 9.3.14.2-9 Google Earth Visualization of the Proposed Pisgah SEZ (power towers visible on horizon) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from the Old Spanish National Historic Trail near Yermo, California

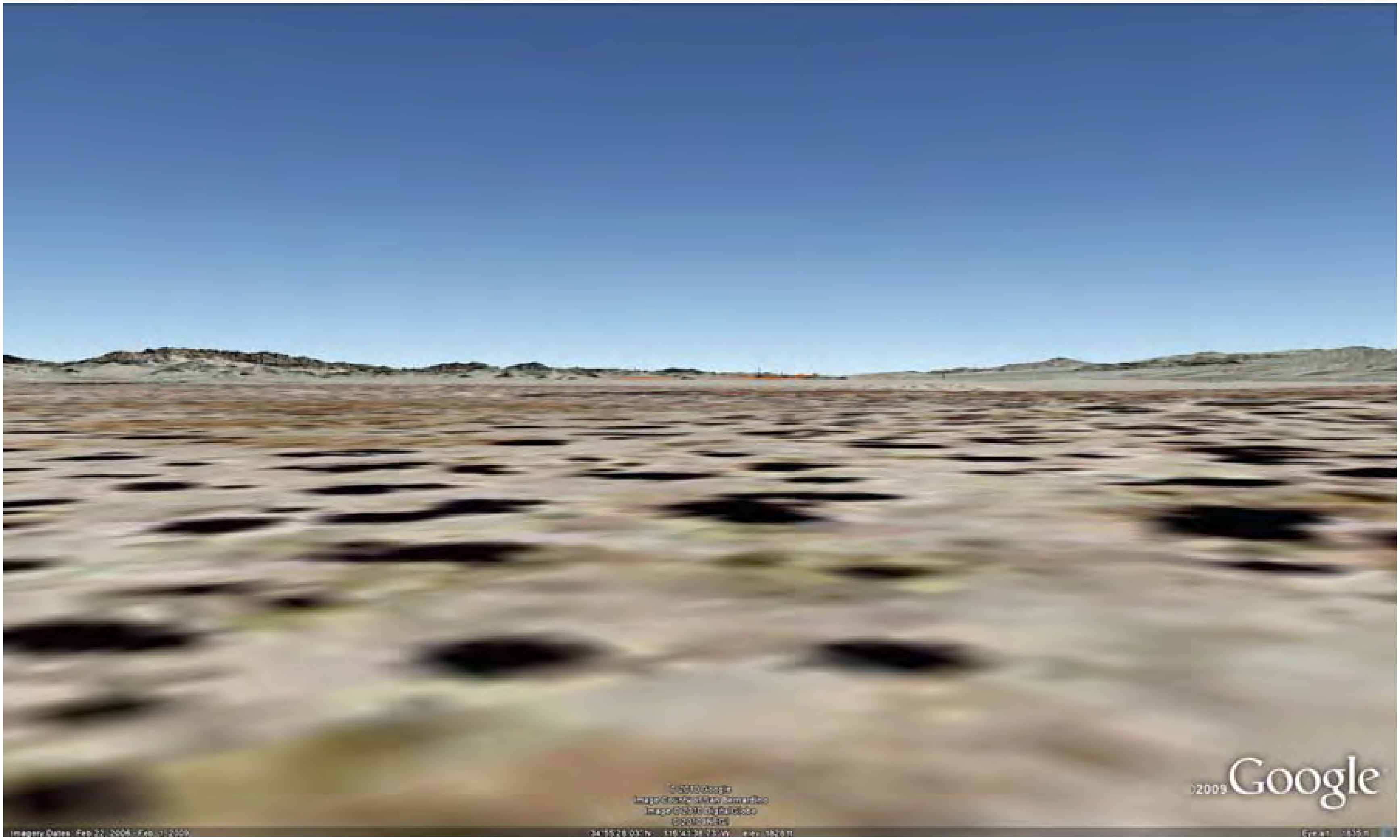

FIGURE 9.3.14.2-10 Google Earth Visualization of the Proposed Pisgah SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Model, as Seen from the Old Spanish National Historic Trail near the Trail Fork North of Newberry Springs, California

in orange) as seen from the Old Spanish National Historic Trail near the trail fork, north of the community of Newberry Springs.

The visualization suggests that at this point on the trail, lower height facilities within the western portion of the SEZ could be visible, in the absence of screening by vegetation or structures. At this distance, the receivers of operating power towers in the SEZ would appear as distant points of light on the eastern horizon, against a sky backdrop, or the bajadas of the Cady or Rodman Mountains. The tower structures would likely be visible underneath the receiver lights.

If sufficiently tall, the power towers could have red or white flashing hazard navigation lights that could be visible from the trail at night, although other lights would be visible in the vicinity of the SEZ. Other lighting associated with solar facilities in the SEZ could be visible as well, at least for facilities in the closest portions of the SEZ.

Because of the distance and partial screening by intervening landforms, the SEZ would occupy a small portion of the field of view, and the viewing angle would be low. Weak visual contrasts would be expected at this location on the trail.

For trail users continuing along the Armijo segment, after the fork, the trail loses elevation and passes out of the SEZ viewshed approximately 1.2 mi (1.9 km) east of the fork. The Northern Route turns more northward and gradually climbs approximately 100 ft (30 m) over about 10 mi (18 km) to reach Alvord Mountain, and there passes out of the SEZ viewshed.

As trail users traveled northward on the Northern Route, the SEZ would be behind them, and solar facilities within the western portion of the SEZ would potentially be visible to the south and east. In some stretches of the trail, however, only the upper portions of sufficiently tall power towers located in visible portions of the SEZ could be seen. Because of the distance and partial screening by intervening landforms, the SEZ would occupy a small portion of the field of view, and the viewing angle would be low. Weak visual contrasts would be expected.

As the trail rose into the Alvord Mountain area, slightly more of the SEZ would become visible, but the distance would be great enough (15+ mi [25+ km]) and the angle of view still low enough that visual contrasts would be expected to remain weak.

Trail users westbound on the trail would view the SEZ to the southeast as they either descended from Alvord Mountain (if traveling the Northern Route) or passed the Cady Mountains and entered the viewshed 1.2 mi (1.9 km) east of the trail fork (if on the Armijo segment). Travelers on the Armijo segment would have already passed the SEZ when they entered the viewshed, and it would be visible only briefly and with very low levels of visual contrast expected. Travelers on the Northern Route would have longer views of the SEZ as they traveled southward to the fork, but as noted above, visual contrasts seen from this section of the trail would be expected to be very low.

In summary, although about 29 mi (46 km) of the Old Spanish National Historic Trail are within the 25-mi (40-km) viewshed of the Pisgah SEZ, and the trail passes within 6 mi (10 km) of the SEZ, trail viewpoints are either too distant from the SEZ, partially screened from views of the SEZ, and/or have too low an angle of view to the SEZ to be subject to even moderate visual contrasts from solar facilities within the SEZ. The nature of the visual contrasts from solar facilities in the SEZ as observed from the trail would depend on viewer location, the numbers, types, sizes, and locations of solar facilities in the SEZ, and other project- and site-specific factors, but under the 80% development scenario analyzed in the PEIS, solar facilities in the SEZ would be expected to cause weak levels of visual contrast for viewpoints on the Old Spanish National Historic Trail.

Additional scenic resources exist at the national, state, and local levels, and impacts on both federal and nonfederal lands may occur, including sensitive traditional cultural properties important to Tribes. In addition to the resource types and specific resources analyzed in this PEIS, future site-specific NEPA analyses would include state and local parks, recreation areas, other sensitive visual resources, and communities close enough to the proposed project to be affected by visual impacts. Selected other lands and resources are included in the discussion below.

In addition to impacts associated with the solar energy facilities themselves, sensitive visual resources could be affected by facilities that would be built and operated in conjunction with the solar facilities. With respect to visual impacts, the most important associated facilities would be access roads and transmission lines, the precise location of which cannot be determined until a specific solar energy project is proposed. Currently there is a 230-kV transmission line within the proposed SEZ. For this analysis, the impacts of construction and operation of transmission lines outside of the SEZ were not assessed, assuming that the existing 230-kV transmission line might be used to connect some new solar facilities to load centers, and that additional project-specific analysis would be done for new transmission construction or line upgrades. Note that depending on project- and site-specific conditions, visual impacts associated with access roads, and particularly transmission lines, could be large. Detailed information about visual impacts associated with transmission lines is presented in Section 5.7.1. A detailed site-specific NEPA analysis would be required to precisely determine visibility and associated impacts for any future solar projects, based on more precise knowledge of facility location and characteristics.

Impacts on Selected Other Lands and Resources

Historic Route 66 (National Old Trails Highway) and Interstate 40. Since 1990, Route 66 in California has been designated as "State Historic Highway Route 66," but Route 66 is not designated as a scenic highway, though it is of nationwide historic interest. I-40 is eligible for designation as a state scenic highway but has not been officially designated. Traveling east from Barstow, Route 66 follows I-40. The AADT value for I-40 at Hector Road is 12,500 vehicles, with an expected 15% increase as a result of solar energy development within the SEZ. East of Daggett, Route 66 leaves I-40, but crosses it three times. Because the two routes parallel each other so closely in the area of the SEZ, they would be subject to similar levels of visual contrasts from solar facilities within the SEZ, and are therefore discussed together.

As shown in Figure 9.3.14.2-2, approximately 48 mi (77 km) of Route 66 and I-40 are within the 650-ft (198.1-m) viewshed of the Pisgah SEZ, with an estimated 8 mi (13 km) of I-40 and 5 mi (8 km) of Route 66 running through the SEZ. I-40 intersects the SEZ in five separate areas ranging in lengths from approximately 0.7 to 2 mi (1 to 3 km). Route 66 intersects the SEZ in four separate areas ranging in lengths from approximately 0.1 to 2 mi (0.2 to 3 km). Undulations in topography as well as buildings screen views of portions of the SEZ from some locations along the two roadways; however, there are generally open views of the SEZ throughout the viewshed.

For westbound travelers on the roadways, the receivers of sufficiently tall power towers might be just visible over the western horizon 13 mi (21 km) east of Ludlow, about 26 mi (42 km) from the eastern boundary of the SEZ; however, at that distance, the impacts would be minimal. As travelers crested a hill approximately 5 mi (8 km) west of the SEZ, lower height solar facilities in the eastern portion of the SEZ would come into view, and contrast levels would increase rapidly over the next few minutes as travelers approached the SEZ at highway speeds. The road passes through several dips that might partially conceal some facilities within the SEZ briefly.

Figure 9.3.14.2-11 is a Google Earth visualization of the SEZ as seen from I-40, approximately 3 mi (5 km) east of the intersection of I-40 and the SEZ, facing northwest toward the center of the SEZ. The visualization suggests that from this location, the SEZ would occupy much of the horizontal field of view, but because the viewing angle is very low, small undulations in topography might screen views of lower-height solar facilities away from the roadways. Power blocks, power towers, transmission towers, and other taller facilities, as well as steam plumes (if present) would likely be visible, however, and sufficiently close to cause stronger visual contrasts, primarily line contrasts. The receivers of operating power towers in the far eastern portion of the SEZ could appear as very bright, non-point light sources atop plainly visible tower structures and would strongly attract visual attention. These bright light sources could interfere with views of the distant mountains to the south and west, or could project above the horizon onto a sky backdrop.

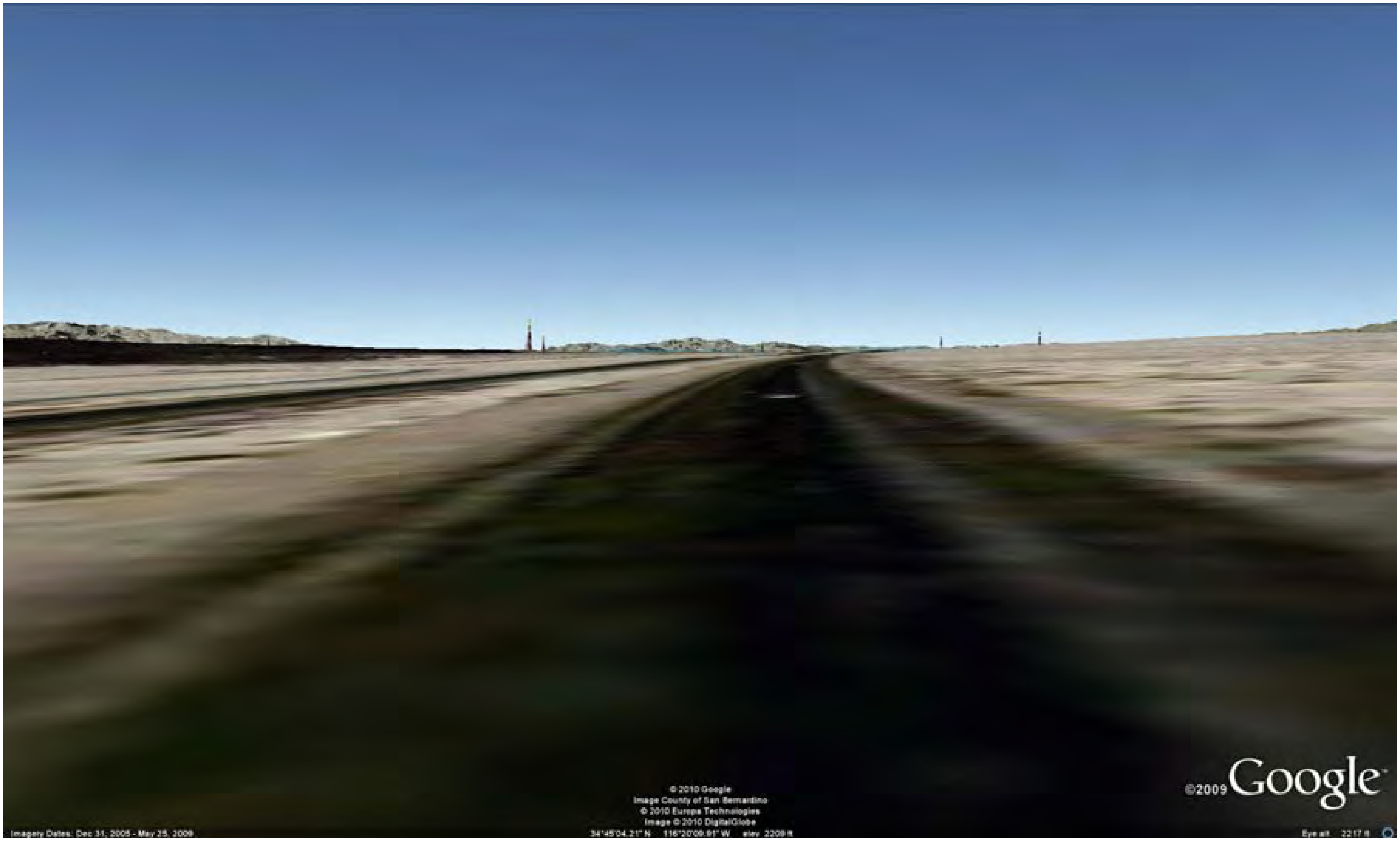

FIGURE 9.3.14.2-11 Google Earth Visualization of the Proposed Pisgah SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from I-40 Approximately 2.7 mi (4.3 km) East of the SEZ

If sufficiently tall, power towers could have flashing red or white hazard navigation lights that could be visible for long distances down the roadways at night. These lights could become conspicuous as travelers approached the SEZ, and would be likely to attract visual attention.

Figure 9.3.14.2-12 is a Google Earth visualization of the SEZ as seen from I-40, approximately 0.7 mi (1 km) east of the intersection of the highway and the SEZ, facing northwest toward the center of the SEZ. The visualization suggests that from this location, solar facilities within the SEZ would be in full view, and the SEZ would occupy more than the entire field of view, and travelers would have to turn their heads to scan across the full SEZ. Facilities located within the southeastern portion of the SEZ would strongly attract the eye and likely dominate views from the roadways. Structural details of some facility components could be visible. Views of the Mojave Valley to the west and northwest would be completely or partially screened by solar facilities, and views of the Cady Mountains and Rodman Mountains could be fully or near fully screened as well, depending on the layout of solar facilities within the SEZ. Because of the very short distance from the roadways, strong visual contrasts could result, depending on solar project characteristics and location within the SEZ.

Visual contrast would increase farther as travelers on the roadways entered the SEZ. If power tower facilities were located in the SEZ, the receivers could appear as brilliant white light sources on either side of the roadways and would likely strongly attract views. In addition, during certain times of the day from certain angles, sunlight on dust particles in the air might result in the appearance of light streaming down from the tower(s). Looking ahead down the roadways, if solar facilities were located on both the north and south sides of the roads, the banks of solar collectors on both sides of the byway could form a visual “tunnel” that travelers would pass through briefly. If solar facilities were located close to the roadways, given the 80% development scenario analyzed in the PEIS, they would be expected to dominate views from the roadways and would create strong visual contrasts. After passing through the section of SEZ, the SEZ would still be very close to the roadways on one or the other side of the highways, with impact levels dependent on the presence of solar facilities in areas near the roadways and solar facility characteristics.

Figure 9.3.14.2-13 is a Google Earth visualization of the SEZ as seen from Route 66 within the SEZ, 3 mi (5 km) west of the easternmost intersection of Route 66 and the SEZ, facing north toward the center of the SEZ. The largest power tower receiver visible is approximately 1.7 mi (2.7 km) northwest of the viewpoint.

The visualization suggests that if viewed from this location on Route 66, the SEZ would occupy more than the entire field of view, and that solar energy facilities within the SEZ could potentially dominate the view from Route 66, depending on the technology employed and other visibility factors. Structural details of some facility components might be visible, and if sufficiently tall power tower receivers were present within the SEZ, they could project above mountains to the north and be visible against a sky backdrop. Steam plumes, transmission towers, and other tall facility components could also project above the mountains. From this viewpoint, solar collector/reflector arrays would be seen nearly edge on and would repeat the horizontal line of the plain in which the SEZ is situated, which would tend to reduce visual line contrast. As the viewer passed through the SEZ, however, the collector arrays could increase in

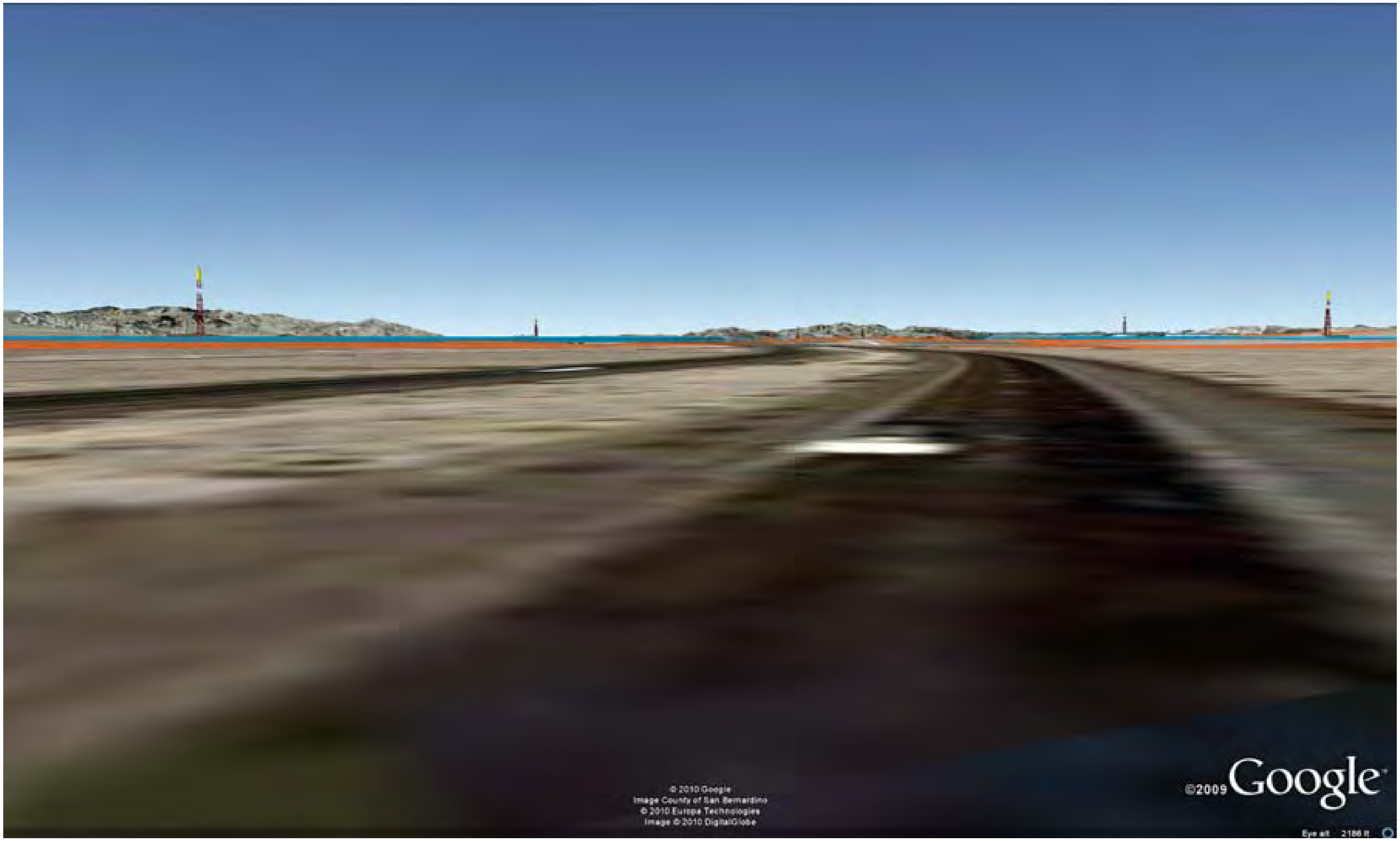

FIGURE 9.3.14.2-12 Google Earth Visualization of the Proposed Pisgah SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from I-40 Approximately 0.7 mi (1 km) East of the SEZ

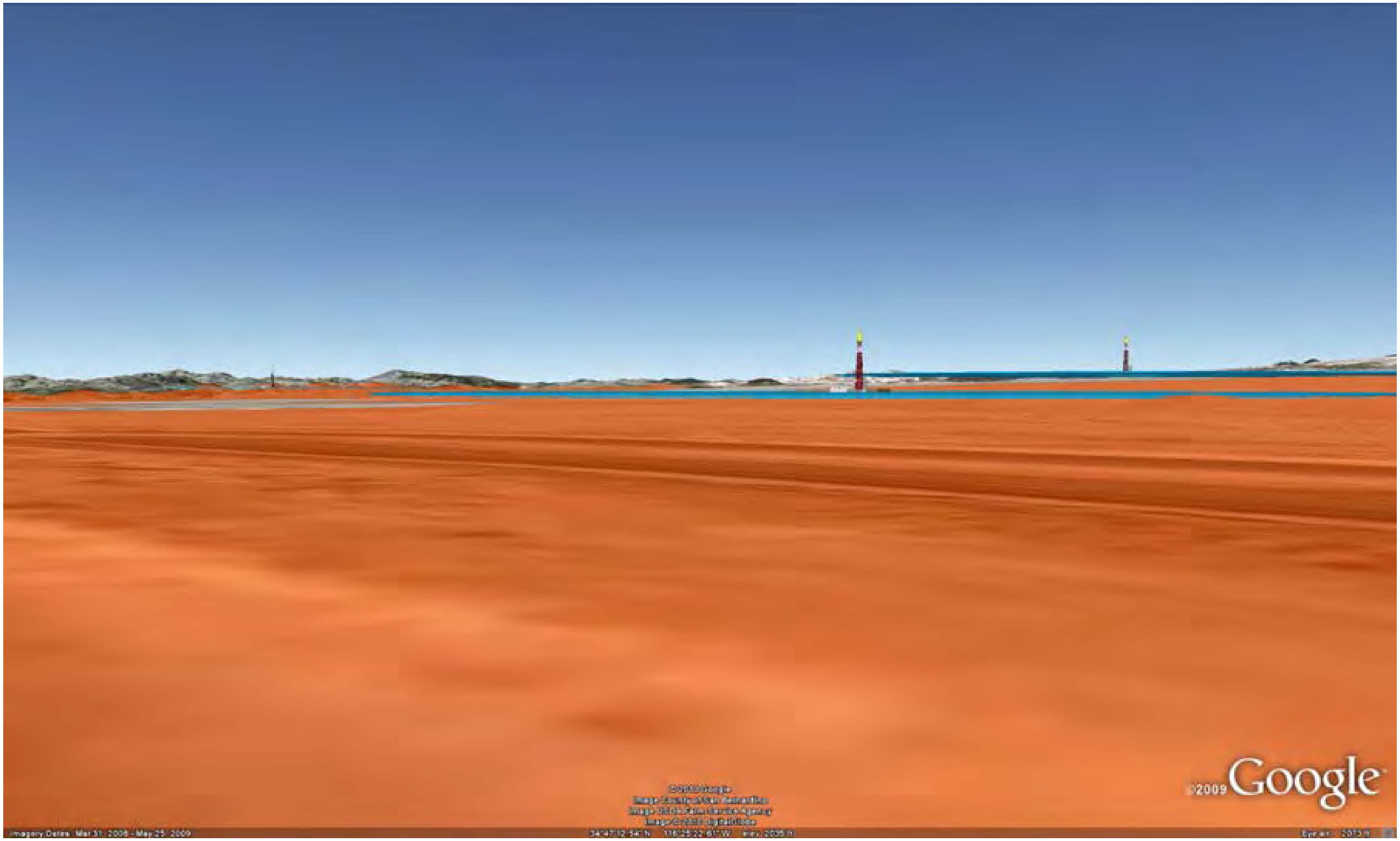

FIGURE 9.3.14.2-13 Google Earth Visualization of the Proposed Pisgah SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Route 66 within the SEZ, 2.8 mi (4.5 km) West of the Easternmost Intersection of Route 66 and the SEZ

apparent size until they no longer appeared as horizontal lines against the natural appearing backdrop.

Road travelers heading east on the roadways would in general be subjected to the same types of visual contrasts, but the order would be reversed, which could change the perceived impact levels. Because of differences in topography between the eastern and western approaches to the SEZ, more of the SEZ would be visible for longer distances for eastbound travelers. Solar facilities within the SEZ could be visible as far as Barstow (25+ mi [41+ km]), with power tower receivers appearing as distant lights on the eastern horizon at that distance.

From Barstow eastward, except for brief periods, travelers would have continuous visibility of solar facilities within some part of the SEZ as they approached it. Solar facilities within the SEZ would gradually increase in apparent size, with the view opening up substantially (and visual contrast levels rising accordingly) as travelers approached Newberry Springs. Visual dominance of the solar facilities within the SEZ would increase steadily until peaking when travelers entered and passed through the SEZ.

The nature of the visual contrasts from solar facilities in the SEZ as observed from I-40 and Route 66 would depend on the numbers, types, sizes, and locations of solar facilities in the SEZ, and other project- and site-specific factors. Under the 80% development scenario analyzed in the PEIS, because the roadways pass through the SEZ, strong visual contrasts could be observed from the roadways in and near the SEZ.

Interstate 15. As shown in Figure 9.3.14.2-2, approximately 34 mi (55 km) of I-15 is within the 650-ft (198.1-m) viewshed of the Pisgah SEZ, with an estimated 18 mi (29 km) within the 7.5-m (24.6-ft) viewshed. Undulations in topography as well as buildings screen views of portions of the SEZ from some locations along I-15; however, there are generally open views of the SEZ from I-15 throughout the SEZ viewshed. Visibility distances from I-15 to the SEZ within the 25-mi (41-km) SEZ viewshed range from 9 to 22 mi (14 to 35 km).

For about one-half of the distance, the SEZ is in view of I-15, primarily in the northeast portion of the SEZ viewshed, and intervening topography would screen all but the upper portions of sufficiently tall power towers located in visible portions of the SEZ. From these areas, generally 9 to 18 mi (14 to 29 km) from the SEZ, the receivers on power towers would look like point-like or nearly point-like lights on the southern horizon, against the backdrop of the valley floor or the Rodman Mountains. If sufficiently tall, power towers could have flashing red or white hazard navigation lights that would likely be visible from I-15 at night, although other lights would be visible in the vicinity.

Farther southwest on I-15, lower height solar facilities would become visible. The point of closest approach to the SEZ on I-15 is north of Newberry Springs. At this distance, the power tower receivers would appear as distant points of light on the eastern horizon, against a sky backdrop, or bajadas of the Cady or Rodman Mountains. Depending on project-specific factors, lighting, and other visibility factors, power tower structures could be visible underneath the receiver lights. Because of the distance and partial screening by intervening landforms, the SEZ would occupy a small portion of the field of view, and the viewing angle would be low. Weak visual contrasts would be expected. Westward beyond this point, the distance to the SEZ would increase, and therefore the apparent size of the SEZ and solar facilities within the SEZ would decrease, and associated visual contrasts would diminish accordingly.

Burlington Northern Santa Fe Railroad. The Burlington Northern Santa Fe (BNSF) Railroad and Union Pacific (UP) Railroad are privately run freight train services whose rail lines are within the viewshed of the SEZ. The BNSF rail line also runs through the SEZ. Amtrak's Southwest Chief passenger train travels these same BNSF tracks through the SEZ and within the SEZ viewshed. It provides daily service between Chicago and Los Angeles and promotes the scenery of the American West to its passengers. The rail line serves Barstow and travels through the SEZ for approximately 9 mi (15 km). Approximately 55 mi (89 km) of the passenger service line are within the SEZ viewshed. The railroad roughly parallels I-40 within the SEZ, and impacts on passengers on the Southwest Chief would be similar to those described for travelers on I-40 and Route 66 (see above). Strong visual contrasts would be expected under the 80% development scenario analyzed in the PEIS.

Communities of Barstow, Daggett, Yermo, Newberry Springs, and Ludlow. The viewshed analyses indicate visibility of the SEZ from the communities of Barstow (approximately 25 mi [41 km] west of the SEZ), Daggett (approximately 17.7 mi [28.5 km] west of the SEZ), Yermo (approximately 15 mi [23 km] northwest of the SEZ), Newberry Springs (approximately 7 mi [11 km] west of the SEZ), and Ludlow (approximately 12 mi [19 km] east of the SEZ). Screening by small undulations in topography, vegetation, buildings, or other structures would likely restrict or eliminate visibility of the SEZ and associated solar facilities within these communities, but a detailed future site-specific NEPA analysis is required to determine visibility precisely. However, note that even with existing screening, solar power towers, cooling towers, plumes, transmission lines and towers, or other tall structures associated with the development could potentially be tall enough to exceed the height of screening and cause visual impacts on these communities.

Barstow is elevated approximately 450 ft (140 m) above the western boundary of the SEZ, and as the valley slopes downward gently but steadily to the east, the easternmost portions of Barstow would have a view of the distant SEZ. At 25 mi (42 km), however, the SEZ would occupy a very small part of the field of view, and the angle of view would be very low, so that if solar facilities were visible within the SEZ, they would be viewed edge-on. The light from power tower receivers within the SEZ would likely appear as distant points of light on the eastern horizon. If sufficiently tall, power towers could have flashing red or white hazard navigation lights that could potentially be visible from Barstow at night, although other lights would be visible in the vicinity. Visual contrasts associated with solar facilities within the SEZ would be minimal.

Daggett is elevated approximately 250 ft (76 m) above the western boundary of the SEZ. At 18 mi (29 km), the SEZ occupies a slightly larger portion of the field of view than viewed from Barstow, but the angle of view would still be very low, so that if solar facilities were visible within the SEZ, they would be viewed edge-on. The light from power tower receivers within the SEZ would likely appear as distant points of light on the eastern horizon. If sufficiently tall, power towers could have flashing red or white hazard navigation lights that could potentially be visible from Daggett at night, although other lights would be visible in the vicinity. Visual contrasts associated with solar facilities within the SEZ would be expected to be weak. It should be noted that a variety of industrial facilities, including the SEGS I and II solar plants, are located immediately east of Daggett and likely screen much of the view of the SEZ from some locations in Daggett.

Yermo is elevated approximately 250 ft (76 m) above the western boundary of the SEZ. At 15 mi (23 km), the SEZ occupies a slightly larger portion of the field of view than viewed from Daggett, but the angle of view would still be very low, so that if solar facilities were visible within the SEZ, they would be viewed edge-on. The light from power tower receivers within the SEZ would likely appear as points of light on the eastern horizon. If sufficiently tall, power towers could have flashing red or white hazard navigation lights that would likely be visible from Yermo at night, although other lights would be visible in the vicinity. Visual contrasts associated with solar facilities within the SEZ would be expected to be weak.

Newberry Springs is elevated approximately 80 ft (24 m) above the western boundary of the SEZ. At 7 mi (11 km), the SEZ would occupy a substantial portion of the field of view, but the angle of view would be low, so that if solar facilities were visible within the SEZ, they would be viewed edge-on and would repeat the line of the horizon, tending to reduce visual contrast. The light from power tower receivers within the SEZ would likely appear as very bright non-point sources of light on the eastern horizon. If sufficiently tall, power towers could have flashing red or white hazard navigation lights that could potentially be conspicuous from Newberry Springs at night, although other lights would be visible in the vicinity. Visual contrasts associated with solar facilities within the SEZ would be expected to be moderate.

Ludlow is elevated approximately 390 ft (120 m) below the eastern boundary of the SEZ. Intervening topography between Ludlow and the SEZ would screen all but the upper portions of sufficiently tall power towers located in visible portions of the SEZ from view from Ludlow. At 12 mi (19 km) from the SEZ, the receivers on visible power towers would look like point-like or nearly point-like lights on the western horizon. If sufficiently tall, power towers could have flashing red or white hazard navigation lights that could potentially be visible from Ludlow at night, although other lights would be visible in the vicinity. Visual contrasts associated with solar facilities within the SEZ would be expected to be minimal.

Regardless of visibility from within these communities, residents, workers, and visitors would be likely to experience visual impacts from solar energy facilities located within the SEZ (as well as any associated access roads and transmission lines) as they travel area roads, including the roads discussed above.

Nearby Residents. Scattered ranches and other residences are located on private lands immediately adjacent or close to the SEZ and within the SEZ viewshed. Depending on technology and project-specific factors, because of the close proximity and large size of likely facilities, these residents could be subjected to large visual impacts from solar energy development within the SEZ. These impacts would be determined in the course of a site-specific environmental impact analysis.

9.3.14.2.3 Summary of Visual Resource Impacts for the Proposed Pisgah SEZ

Under the 80% development scenario analyzed in this PEIS, there could be multiple solar facilities within the Pisgah SEZ, a variety of technologies employed, and a range of supporting facilities that would contribute to visual impacts, such as transmission towers and lines, substations, power block components, and roads. The resulting visually complex landscape would be essentially industrial in appearance and would contrast strongly with the surrounding more natural-appearing landscape. Large visual impacts on the SEZ and surrounding lands within the SEZ viewshed would be associated with solar energy development due to major modification of the character of the existing landscape. There is the potential for additional impacts from construction and operation of transmission lines and access roads within the SEZ.

Residents, workers, and visitors to the area may experience visual impacts from solar energy facilities located within the SEZ (as well as any associated access roads and transmission lines) as they travel area roads, including I-40, I-15, and Historic Route 66. Travelers on I-40 and Historic Route 66 would be likely to experience strong visual contrasts as they pass through the SEZ, as would passengers on the Amtrak rail line serving Barstow. Nearby residents could be subjected to large visual impacts from solar energy development within the SEZ. Of the nearby communities, residents of Newberry Springs would be likely to experience moderate visual contrasts.

Utility-scale solar energy development within the proposed Pisgah SEZ is likely to cause moderate to strong visual impacts on highly sensitive visual resource areas within the 25-mi (40-km) viewshed of the SEZ, including the Cady Mountains WSA and the Rodman Mountains WA. Because the SEZ is located within the CDCA, some CDCA lands within the SEZ viewshed could be subject to strong visual contrast levels as a result of solar facility development within the SEZ.

9.3.14.3 SEZ-Specific Design Features and Design Feature Effectiveness

As noted in Section 5.12, the presence and operation of large-scale solar energy facilities and equipment would introduce major visual changes into nonindustrialized landscapes and could create strong visual contrasts in line, form, color, and texture that could not easily be mitigated substantially. Implementation of the programmatic design features that are presented in Appendix A, Section A.2.2, would be expected to reduce the magnitude of visual impacts experienced; however, the degree of effectiveness of these design features could be assessed only at the site- and project-specific level. Given the large-scale, reflective surfaces and strong regular geometry of utility-scale solar energy facilities, and the typical lack of screening vegetation and landforms within the SEZ viewsheds, siting the facilities away from sensitive visual resource areas and other sensitive viewing areas is the primary means of mitigating visual impacts. The effectiveness of other visual impact mitigation measures would generally be limited.

While the applicability and appropriateness of some mitigation measures would depend on site- and project-specific information that would be available only after a specific solar energy project had been proposed, the following SEZ-specific design features can be identified for the Pisgah SEZ at this time:

- Within the SEZ, in areas visible from and within 1 mi (1.6 km) of the Cady Mountains WSA, visual impacts associated with solar energy project operation should be consistent with VRM Class II management objectives (see Table 9.3.14.3-1), as experienced from KOPs (to be determined by the BLM) within the WSA, and in areas visible from between 1 and 3 mi (1.6 and 4.8 km); visual impacts should be consistent with VRM Class III management objectives. The VRM Class II impact level consistency mitigation would affect approximately 2,237 acres (9 km^2) within the western portion of the SEZ. The VRM Class III impact level consistency mitigation would affect approximately 7,961 additional acres (32 km^2).

TABLE 9.3.14.3-1 VRM Management Class Objectives

	VRM Management Class Objectives
Class I Objective	The objective of this class is to preserve the existing character of the landscape. This class provides for natural ecological changes; however, it does not preclude very limited management activity. The level of change to the characteristic landscape should be very low and must not attract attention.
Class II Objective	The objective of this class is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.
Class III Objective	The objective of this class is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.
Class IV Objective	The objective of this class is to provide for management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements.

Source: BLM (1986b).

- Within the SEZ, in areas located south of I-40 and visible from and between 1 and 3 mi (1.6 and 4.7 km) of the Rodman Mountains WA, visual impacts associated with solar energy project operation should be consistent with VRM Class III management objectives as experienced from KOPs determined by the BLM within the WA. The VRM Class III impact level consistency mitigation would affect approximately 454 acres (1.8 km^2).

Figure 9.3.14.3-1 shows the areas within the SEZ affected by these SEZ-specific design features.

Application of the SEZ-specific design features above would substantially reduce visual impacts associated with solar energy development within the SEZ.

Application of the SEZ-specific design feature to restrict allowable visual impacts associated with solar energy project operations within 3 mi (4.8 km) of the Cady Mountains WSA would substantially reduce potential visual impacts on the WA by limiting impacts within the BLM-defined foreground of the viewshed of this area, where potential visual impacts would be greatest.

Application of the SEZ-specific design feature to restrict allowable visual impacts associated with solar energy project operations south of I-40 and between 1 and 3 mi (2 and 5 km) of the Rodman Mountains WA would substantially reduce potential visual impacts on the WA by limiting impacts within the BLM-defined foreground of the viewshed of this area, where potential visual impacts would be greatest. This design feature would also reduce impacts on travelers on I-40 and Route 66.

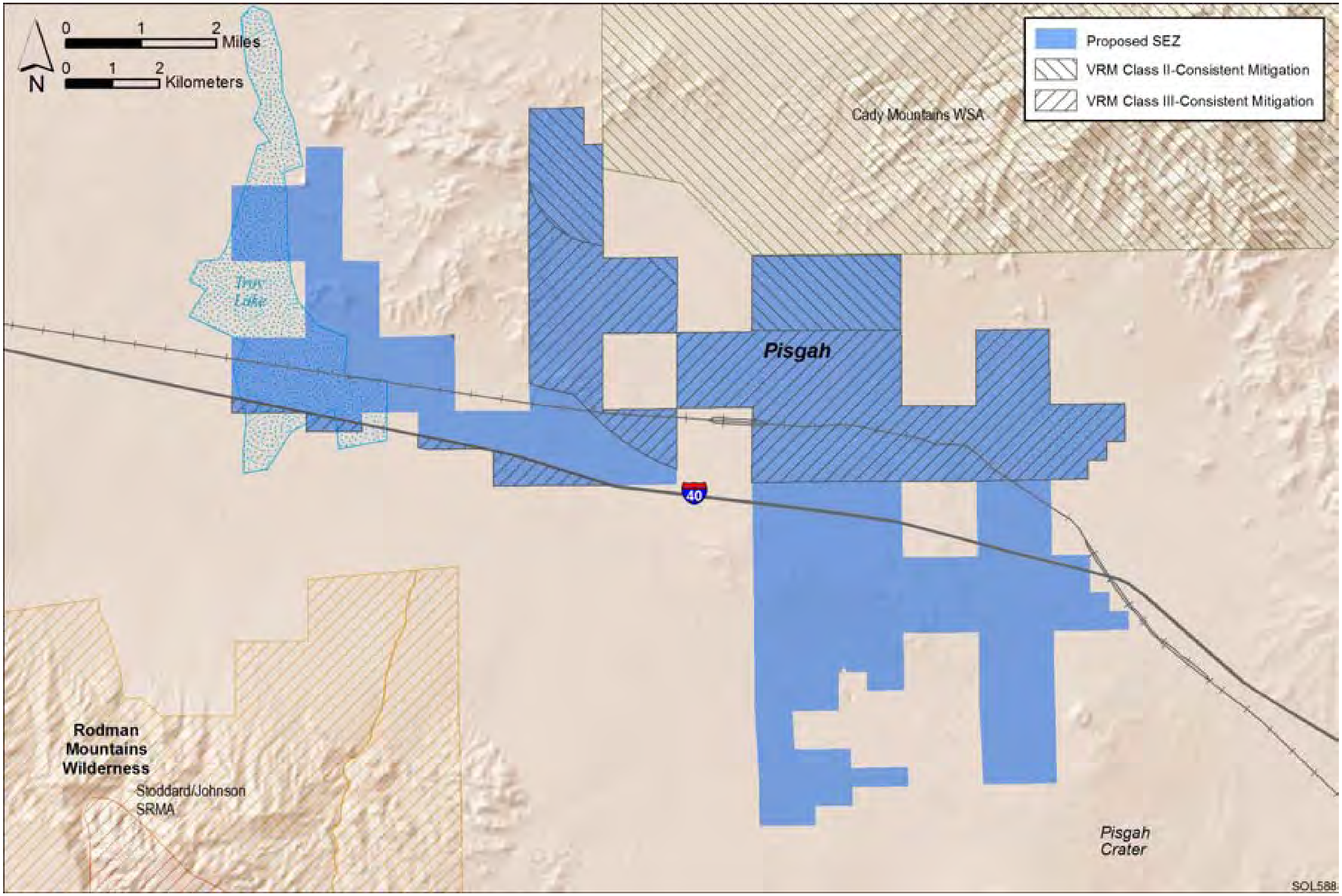

FIGURE 9.3.14.3-1 Areas within the Proposed Pisgah SEZ Affected by Zone-Specific Distance-Based Visual Impact Design Features

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9.3.15 Acoustic Environment

9.3.15.1 Affected Environment

The proposed Pisgah SEZ is located in the central portion of San Bernardino County in Southeastern California. The County of San Bernardino has established noise standards for stationary sources, mobile sources, and all other structures (County of San Bernardino 2009). Noise standards applicable to solar energy development are those for stationary sources based on affected land use and time of day: 55 dBA daytime L_{eq} and 45 dBA nighttime L_{eq} for residential land use. Combining these two levels is the same as the EPA guideline of 55 dBA as L_{dn} for residential areas. In San Bernardino County, temporary construction activities between 7 a.m. and 7 p.m., except Sundays and federal holidays, are exempted from the noise regulations.

I-40, State Route 66 (National Trails Highway), and the BNSF Railway run east–west through the proposed Pisgah SEZ, and Memorial Drive runs through the southern edge of the western portion of SEZ. The nearest airports are Barstow-Daggett Airport and the privately owned Ludlow Airport, which are located about 12 mi (19 km) west and east of the SEZ, respectively. Twentynine Palms Marine Corps Base is located just south of the SEZ. Because of the presence of the Mojave Aquifer, the largest aquifer in the western U.S., diverse agricultural activities including irrigated crops, livestock, and aquaculture are scattered over the area to the west of the SEZ. Many man-made water-skiing and jet-skiing lakes are also located to the west of the SEZ. Mining operations exist in the southeastern portion of the SEZ. No livestock grazing exists, and little recreational use and limited hunting occurs onsite. No sensitive receptors (e.g., hospitals, schools, or nursing homes) exist near the Pisgah SEZ. The nearest noise receptor lies next to the northwestern corner of the SEZ boundary (about 40 ft [12 m] away). The next nearest receptors are a cluster of residences within about 500 ft (150 m) of the SEZ just south of the I-40 rest area at the south-central edge of the western portion of the SEZ. No residences exist to the east of the SEZ, downwind of prevailing westerly winds in the area. The closest population center with schools is Newberry Springs, which is located about 6 mi (10 km) west of the proposed Pisgah SEZ. Therefore, noise sources around the SEZ include road traffic, railroad traffic, aircraft flyover, agricultural activities, industrial activities including mining, and activities and events at nearby communities. The proposed Pisgah SEZ is mostly undeveloped, and its overall character is considered rural to industrial. To date, no environmental noise survey has been conducted near the Pisgah SEZ. On the basis of the population density in San Bernardino County, the day-night average sound level (L_{dn} or DNL) is estimated to be 41 dBA for San Bernardino County, typical of a rural area[11] (Eldred 1982; Miller 2002). However, maximum noise levels in the SEZ would be over 70 dBA L_{dn} along I-40 or the BNSF Railway (County of San Bernardino 2009); thus, noise levels are estimated to be higher than 55 dBA L_{dn} up to 0.3 mi (0.5 km) from I-40 or the railroad. In addition, noise levels would be relatively high near the western boundary of the SEZ because of agricultural and industrial activities that take place to the west.

[11] Rural and undeveloped areas have sound levels in the range of 33 to 47 dBA as L_{dn} (Eldred 1982). Typically, the nighttime level is 10 dBA lower than daytime level, and it can be interpreted as 33 to 47 dBA (mean 40 dBA) during the daytime hours and 23 to 37 dBA (mean 30 dBA) during nighttime hours.

9.3.15.2 Impacts

Potential noise impacts associated with solar projects in the Pisgah SEZ would occur during all phases of the projects. During the construction phase, potential noise impacts associated with operation of heavy equipment and vehicular traffic would be anticipated, albeit of short duration, at the nearest residence (just next to the northwestern SEZ boundary). During the operations phase, potential impacts on nearby residences would be anticipated, depending on the solar technologies employed. Noise impacts shared by all solar technologies are discussed in detail in Section 5.13.1, and technology-specific impacts are presented in Section 5.13.2. Impacts specific to the Pisgah SEZ are presented in this section. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through any additional SEZ-specific design features applied (see Section 9.3.15.3 below). This section primarily addresses potential noise impacts on humans, although potential impacts on wildlife at nearby sensitive areas are discussed. Additional discussion on potential noise impacts on wildlife is presented in Section 5.10.2.

9.3.15.2.1 Construction

The proposed Pisgah SEZ has a relatively flat terrain; thus, minimal site preparation activities would be required, and associated noise levels would be lower than those during general construction (e.g., erecting building structures and installing equipment, piping, and electrical). Solar array construction would also generate noise, but both noise and construction would be spread over a wide area.

For the parabolic trough and power tower technologies, the highest construction noise levels would occur at the power block area; a maximum of 95 dBA at a distance of 50 ft (15 m) is assumed, if impact equipment such as pile drivers or rock drills is not being used. Typically, the power block area is located in the center of the solar facility, at a distance of more than 0.5 mi (0.8 km) from the facility boundary. However, noise levels from construction of the solar array would be lower than 95 dBA. With geometric spreading and ground effects, as explained in Section 4.13.1, noise levels would attenuate to about 40 dBA at a distance of 1.2 mi (1.9 km) from the power block area. This noise level is typical of daytime mean rural background level. In addition, mid- and high-frequency noise from construction activities is significantly attenuated by atmospheric absorption under the low-humidity conditions typical of an arid desert environment, and by temperature lapse conditions typical of daytime hours; thus, noise attenuation to background levels would occur at distances somewhat shorter than 1.2 mi (1.9 km). If a 10-hour daytime work schedule is considered, the EPA guideline level of 55 dBA L_{dn} for residential areas (EPA 1974) would occur at about 1,200 ft (370 m) from the power block area, which would be well within the facility boundary. For construction activities occurring near the northwestern SEZ, estimated noise levels at the nearest residence would be about 74 dBA,[12] which is well above the San Bernardino County standard of 55 dBA daytime L_{eq} for residential

[12] Typically, the heavy equipment operators would not allow public access any closer than 330 ft (100 m) for safety reasons. In other words, construction and solar facility would not occur within this distance from the nearest residence.

land use. In addition, an estimated 70 dBA L_{dn}[13] at this receptor is well above the EPA guideline of 55 dBA L_{dn} for residential areas.

About 72% of the time, winds in the area blow from directions ranging from southwest through northwest inclusive. Accordingly, actual noise levels at the receptors, which are located upwind of prevailing winds, would be much lower than the estimated noise levels due to a shadow zone in the upwind area (discussed below).

It is assumed that a maximum of two projects would be developed at any one time for SEZs greater than 10,000 acres (40.47 km^2) and less than 30,000 acres (121.4 km^2), such as the Pisgah SEZ. If two projects were to be built within the SEZ near the nearest residence, noise levels would be a little higher than the above-mentioned values, below a just-noticeable increase of about 3 dB over a single project.

In addition, noise levels were estimated at the specially designated areas within a 5-mi (8-km) range from the Pisgah SEZ, which is the farthest distance at which noise, other than extremely loud noise, would be discernable. There are three specially designated areas within the range where noise might be an issue. Cady Mountains WSA, Pisgah ACEC, and Ord-Rodman DWMA abut the SEZ to the northeast, the east, and southwest, respectively. For construction activities occurring near one of the specially designated areas, noise levels are estimated to be about 74 dBA at the boundaries of these specially designated areas, higher than the typical daytime mean rural background level of 40 dBA. Thus, if construction would occur near the specially designated areas, portions of those areas close to the SEZ (within approximately 1 mi [1.6 km]) could be disturbed by construction noise from the SEZ. However, sound levels above 90 dB are likely to adversely affect wildlife (Manci et al. 1988). Thus, construction noise is not likely to adversely affect wildlife in nearby specially designated areas, except in areas directly adjacent to the construction site.

Depending on soil conditions, pile driving might be required for the installation of solar dish engines. However, relatively small and quiet pile drivers, such as vibratory or sonic drivers, would be used, rather than the impulsive impact pile drivers frequently seen at large-scale construction sites. Potential impacts on the nearest residence (next to the northwestern SEZ boundary) would be anticipated to be minor, except when pile driving occurred near the residence.

It is assumed that most construction activities would occur during the day, when noise is better tolerated than at night because of the masking effects of background noise. In addition, construction activities for a utility-scale facility are temporary in nature (typically a few years). Construction would cause some unavoidable but localized short-term impacts on neighboring communities, particularly for activities occurring near the northwestern proposed SEZ boundary, close to the nearest residence.

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13 For this analysis, background levels of 40 and 30 dBA for daytime and nighttime hours, respectively, are assumed, which result in day-night average noise level (L_{dn}) of 40 dBA.

Construction activities could result in various degrees of ground vibration, depending on the equipment used and construction methods employed. All construction equipment causes ground vibration to some degree, but activities that typically generate the most severe vibrations are high-explosive detonations and impact pile driving. As for noise, vibration would diminish in strength with distance. For example, vibration levels at receptors beyond 140 ft (43 m) from a large bulldozer (87 VdB at 25 ft [7.6 m]) would diminish below the threshold of perception for humans, which is around 65 VdB (Hanson et al. 2006). During the construction phase, no major construction equipment that can cause ground vibration would be used, and no residences or sensitive structures are located in close proximity. Therefore, no adverse vibration impacts are anticipated from construction activities, except pile driving for dish engines occurring near the residences.

It is assumed that the existing 230-kV transmission line located within the SEZ might be used to connect new solar facilities to the regional grid, and that additional project-specific analysis would be conducted for new transmission construction or line upgrades. However, some construction of transmission lines could occur within the SEZ. Potential noise impacts on nearby residences would be a minor component of construction impacts in comparison with solar facility construction and would be temporary in nature.

9.3.15.2.2 Operations

Noise sources common to all or most types of solar technologies include equipment motion from solar tracking, maintenance and repair activities (e.g., washing of mirrors or replacement of broken mirrors) at the solar array area, commuter/visitor/support/delivery traffic within and around the solar facility, and control/administrative buildings, warehouses, and other auxiliary buildings/structures. Diesel-fired emergency power generators and fire water pump engines would be additional sources of noise, but their operations would be limited to several hours per month (for preventive maintenance testing).

With respect to the main solar energy technologies, noise-generating activities in the PV solar array area would be minimal, related mainly to solar tracking, if used. Dish engine technology, which employs collector and converter devices in a single unit, on the other hand, generally has the strongest noise production.

For the parabolic trough and power tower technologies, most noise during operations would come from the power block area, including the turbine generator (typically in an enclosure), pumps, boilers, and dry- or wet-cooling systems. The power block is typically located in the center of the facility. On the basis of a 250-MW parabolic trough facility with a cooling tower (Beacon Solar, LLC 2008), simple noise modeling indicates that noise levels around the power block would be more than 85 dBA, but that they would decrease to about 51 dBA at the facility boundary, about 0.5 mi (0.8 km) from the power block area. For a facility located near the northwestern corner of the SEZ the predicted noise level would be about 51 dBA at the nearest residence, just next to the SEZ boundary, which is higher than typical daytime mean rural background level of 40 dBA but lower than the San Bernardino County standard of 55 dBA daytime L_{eq}. If TES was not used (i.e., if the operation was limited to daytime, 12 hours only[14]), the EPA guideline level of 55 dBA (as L_{dn} for residential areas) would occur at about 1,370 ft (420 m) from the power block area and thus would not be exceeded outside of the proposed SEZ boundary. At the nearest residence, about 49 dBA L_{dn} would be estimated, which is below the EPA guideline level of 55 dBA (as L_{dn} for residential areas). As for construction, if two parabolic trough and/or power tower facilities were operating close to the nearest residence, combined noise levels would be a little higher than the above-mentioned values, below a just-noticeable increase of about 3 dBA over a single facility. However, if TES was used during nighttime hours, L_{dn} higher than those estimated above would be anticipated, as explained below and in Section 4.13.1.

On a calm, clear night typical of the proposed Pisgah SEZ setting, the air temperature would likely increase with height (temperature inversion) because of strong radiative cooling. Such a temperature profile tends to focus noise downward toward the ground. Thus, there would be little, if any, shadow zone[15] within 1 or 2 mi (2 or 3 km) of the noise source in the presence of a strong temperature inversion (Beranek 1988). In particular, such conditions add to the effect of noise being more discernable during nighttime hours, when the background levels are the lowest. To estimate L_{dn}, 6-hour nighttime generation with TES is assumed after 12-hour daytime generation. For nighttime hours under temperature inversion, 10 dB is added to noise levels estimated from the uniform atmosphere (see Section 4.13.1). On the basis of these assumptions, the estimated nighttime noise level at the nearest residence (about 0.5 mi [0.8 km]) from the power block area for a solar facility located near the northwestern SEZ boundary) would be 61 dBA L_{eq}, which is well above typical nighttime mean rural background level of 30 dBA and the San Bernardino County regulation of 45 dBA nighttime L_{eq}. The day-night average noise level at this residence is estimated to be about 63 dBA L_{dn}, which is higher than the EPA guideline of 55 dBA L_{dn} for residential areas. The assumptions are conservative in terms of operating hours, and no credit was given to other attenuation mechanisms, so it is likely that noise levels would be lower than 63 dBA L_{dn} at the nearest residence, even if TES is used at a solar facility. However, operating parabolic trough or power tower facilities using TES and located near the northwestern SEZ boundary could result in noise levels above typical mean rural background levels, the noise standard/guideline, and corresponding adverse noise impacts on the nearest residence.

Associated with operation of a parabolic trough or power tower solar facility occurring near the Cady Mountains WSA, Pisgah ACEC, and Ord-Rodman DWMA, the estimated daytime level of 51 dBA at the boundary of these areas is higher than the typical daytime mean rural background level of 40 dBA, while the estimated nighttime level of 61 dBA is much higher than the typical nighttime mean rural background level of 30 dBA. However, operation noise from a parabolic trough or power tower solar facility with TES is not likely to adversely affect wildlife at the nearby specially designated areas (Manci et al. 1988).

In the permitting process, refined noise propagation modeling would be warranted, along with measurement of background noise levels.

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[14] Maximum possible operating hours at the summer solstice, but limited to 7 to 8 hours at the winter solstice.

[15] A shadow zone is defined as the region where direct sound does not penetrate because of upward diffraction.

The solar dish engine is unique among CSP technologies because it generates electricity directly and does not require a power block. A single, large, solar dish engine has relatively low noise levels, but a solar facility might employ tens of thousands of dish engines, which would cause high noise levels around such a facility. For example, the proposed 750-MW SES Solar Two dish engine facility in California would employ as many as 30,000 dish engines (SES Solar Two, LLC 2008). At the Pisgah SEZ, assuming a dish engine facility of up to 2,129 MW covering 80% of the total area (19,160 acres [77.54 km^2]), 85,160 25-kW dish engines could be employed. In addition, for a large dish engine facility, more than 1,000 step-up transformers would be embedded in the dish engine solar field, along with several substations; the noise from these sources, however, would be masked by dish engine noise.

The composite noise level of a single dish engine would be about 89 dBA at a distance of 3 ft (0.9 m) (SES Solar Two, LLC 2008). This noise level would be attenuated to about 40 dBA (typical of the mean rural daytime environment) within 340 ft (105 m). However, the combined noise level from tens of thousands of dish engines operating simultaneously would be high in the immediate vicinity of the facility; for example, noise levels would reach about 51 dBA at 1.0 mi (1.6 km) and 48 dBA at 2 mi (3 km) from the boundary of the modeled square-shaped dish engine solar field, both of which are higher than the typical daytime mean rural background level of 40 dBA but lower than the San Bernardino County standard of 55 dBA daytime L_{eq}. These levels would occur at somewhat shorter distances than the aforementioned distances, considering noise attenuation by atmospheric absorption and temperature lapse during daytime hours would reduce noise levels. To estimate noise levels at the nearby residences, it was assumed that dish engines were placed throughout the Pisgah SEZ at intervals of 98 ft (30 m). Under these assumptions, the estimated noise level at the nearest residence (just next to the northwestern SEZ boundary) would be about 56 dBA, which is much higher than the typical daytime mean rural background level of 40 dBA and slightly higher than the daytime San Bernardino County regulation of 55 dBA daytime L_{eq}. On the basis of 12-hour daytime operation, the estimated 54 dBA L_{dn} at this residence is just below the EPA guideline of 55 dBA L_{dn} for residential areas. Estimated noise levels of 59 dBA and 56 dBA L_{dn} at the next nearest residence (about 500 ft [150 m] south of I-40) would be higher but are considerably masked by heavy road traffic noise from I-40. Accordingly, noise from dish engines could cause adverse impacts on the nearby residences, depending on background noise levels and meteorological conditions.

For dish engines placed throughout the SEZ, estimated noise levels would be about 59 dBA at the boundaries of Cady Mountains WSA and Ord-Rodman DWMA and about 56 dBA at the boundary of Pisgah ACEC, which are higher than the typical daytime mean rural background level of 40 dBA. However, dish engine noise from the SEZ is not likely to adversely affect the nearby specially designated areas (Manci et al. 1988).

Consideration of minimizing noise impacts is very important during the siting of dish engine facilities. Direct mitigation of dish engine noise through noise control engineering could also be considered.

During operations, no major ground-vibrating equipment would be used. In addition, no sensitive structures are located close enough to the Pisgah SEZ to experience physical damage. Therefore, potential vibration impacts on surrounding communities and vibration-sensitive structures during operation of any solar facility would be minimal.

Transformer humming noises and switchyard impulsive noises would be generated during the operation of solar facilities. These noise sources would be located near the power block area, typically near the center of a solar facility. Noise from these sources would generally be limited to within the facility boundary and rarely be heard at nearby residences, assuming a 0.5-mi (0.8-km) distance (at least 0.5 mi [0.8 km] to the facility boundary and another 40 ft [10 m] to the nearest residence). Accordingly, potential impacts of these noise sources on the nearest residence would be minimal.

Regarding impacts from transmission line corona discharge noise during rainfall events (discussed in Section 5.13.1.5), the noise level at 50 ft (15 m) and 300 ft (91 m) from the center of a 230-kV transmission line's towers would be about 39 and 31 dBA (Lee et al. 1996), respectively, typical of daytime and nighttime mean background levels in rural environments. Corona noise includes high-frequency components, which is considered to be more annoying than low-frequency environmental noise. However, corona noise would not likely cause impacts, unless a residence was located close to it (e.g., within 500 ft [152 m] of a 230-kV transmission line). The Pisgah SEZ is located in an arid desert environment, and incidents of corona discharge are infrequent. Therefore, potential impacts on nearby residents from corona noise along the transmission line ROW would be negligible.

9.3.15.2.3 Decommissioning/Reclamation

Decommissioning/reclamation requires many of the same procedures and equipment as traditional construction. Decommissioning/reclamation would include dismantling of solar facilities and support facilities such as buildings/structures and mechanical/electrical installations, disposal of debris, grading, and revegetation as needed. Activities for decommissioning would be similar to those for construction but on a more limited scale. Potential noise impacts on surrounding communities would be correspondingly lower than those for construction activities. Decommissioning activities would be of short duration, and their potential impacts would be minor and temporary in nature. The same design features adopted during the construction phase could also be implemented during the decommissioning phase.

Similarly, potential vibration impacts on surrounding communities and vibration-sensitive structures during decommissioning of any solar facility would be lower than those during construction and thus minimal.

9.3.15.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A, Section A.2.2, would greatly reduce or eliminate the potential for noise impacts from development and operation of solar energy facilities. While some SEZ-specific design features are best established when specific project details are being considered, measures that can be identified at this time include the following:

- Noise levels from cooling systems equipped with TES should be managed so that levels at the nearby residences to the northwest and to the south of the SEZ are kept within applicable guidelines. This could be accomplished in several ways, for example, through placing the power block approximately 1 to 2 mi (1.6 to 3 km) or more from residences, limiting operations to a few hours after sunset, and/or installing fan silencers.

- Dish engine facilities within the Pisgah SEZ should be located more than 1 to 2 mi (1.6 to 3 km) from the nearest residences located to the northwest and the south of the SEZ (i.e., the facilities should be located in other portions of the proposed SEZ). Direct noise control measures applied to individual dish engine systems could also be used to reduce noise impacts at the nearest residences.

9.3.16 Paleontological Resources

9.3.16.1 Affected Environment

The Pisgah SEZ is covered predominantly by Quaternary/Tertiary deposits of varying types. The northern and eastern half is mostly thick alluvial deposits (over 100 ft [3 m] thick) ranging in age from the Pliocene to Holocene. The alluvial deposits cover 16,551 acres (67 km^2), or about 69% of the SEZ. The southern and western sections consist primarily of eolian (dune sand), playa, and lacustrine sediments. The eolian sediments cover 588 acres (2.4 km^2), or less than 3% of the SEZ; the playa sediments cover 2,928 acres (12 km^2), or 12% of the SEZ; and the lacustrine sediments cover 767 acres (3 km^2) or 3% of the SEZ. The southeastern sections of the SEZ are composed of volcanic rocks (basalt and andesite). These volcanic deposits cover 2,718 acres (11 km^2), or 11% of the SEZ. Peripheral sections of the northern portions of the SEZ are composed of igneous and metamorphic rocks covering 398 acres (1.6 km^2), or 2% of the SEZ.

In the absence of a PFYC map for the California Desert District, a preliminary classification of PFYC Class 3b is assumed for the alluvial, eolian, playa, and lacustrine deposits. Paleontological resources have been found in ancient lake deposits of Lake Manix, including camel, horse, and a variety of invertebrates (Enzel et al 2003). Class 3 indicates that the potential for the occurrence of significant fossil materials is unknown and needs to be investigated further (see Section 4.8 for a discussion of the PFYC system). The PFYC for the volcanic deposits is Class 1, indicating that the occurrence of significant fossil materials is nonexistent or extremely rare.

A pedestrian survey was conducted in 2008 for the Calico Solar Project (then referred to as the Stirling Solar One Project) to look for surface fossils and exposures of potential fossil-bearing geologic units. A records search completed in addition to the field reconnaissance indicated that the potential for paleontological material is mostly low for areas of younger Quaternary alluvium and volcanic deposits. The potential for paleontological deposits is moderate to high for areas of older Quaternary alluvium, but these deposits are buried at unknown depths. Conditions of certification for the project have been proposed in the CEC staff assessment and Draft EIS for the Calico Solar Project to mitigate possible adverse effects on paleontological resources. These conditions include a worker education program, monitoring of ground disturbance by a professional paleontologist, development of a paleontological resources monitoring and mitigation plan, and instruction to stop work upon discovery of a paleontological resource.

9.3.16.2 Impacts

The potential for impacts on significant paleontological resources at the Pisgah SEZ is unknown. A more detailed investigation of the local geological deposits of the SEZ and their potential depth is needed prior to project approval. Once a project area has been chosen, a paleontological survey will likely be needed following consultation with BLM. The appropriate course of action would be determined as established in BLM IM2008-009 and IM2009-011 (BLM 2007a, 2008). Section 5.14 discusses the types of impacts that could occur to any significant paleontological resources found within the Pisgah SEZ. Impacts would be minimized through the implementation of applicable general mitigation measures listed in Section 5.14, such as monitoring by a qualified paleontologist and development of a management/mitigation plan, as well as required programmatic design features described in Appendix A, Section A.2.2.

Indirect impacts on paleontological resources outside of the SEZ, such as through looting or vandalism, are unknown but unlikely as any such resources would be below the surface and not readily accessible. Programmatic design features for controlling water runoff and sedimentation would prevent erosion-related impacts on buried deposits outside of the SEZ.

No new roads or transmission lines have been assessed for the proposed Pisgah SEZ, assuming the existing corridors would be used; impacts on paleontological resources related to the creation of new corridors would be evaluated at the project-specific level if new road or transmission construction or line upgrades are to occur.

A programmatic design feature requiring a stop work order in the event of an inadvertent discovery of paleontological resources would reduce impacts by preserving some information and allowing possible excavation of the resource, if warranted. Depending on the significance of the find, some modification to the project footprint could result. Since the SEZ is located in an area preliminarily classified as PFYC Class 3b or greater, a stipulation would be included in permitting documents to alert solar energy developers of the possibility of a delay if paleontological resources are uncovered during surface-disturbing activities.

9.3.16.3 SEZ-Specific Design Features and Design Feature Effectiveness

Impacts would be minimized through the implementation of required programmatic design features, including a stop-work stipulation in the event that paleontological resources are encountered during construction, as described in Appendix A, Section A.2.2.

The need for and the nature of any SEZ-specific design features would depend on findings of paleontological surveys.

9.3.17 Cultural Resources

9.3.17.1 Affected Environment

9.3.17.1.1 Prehistory

The proposed Pisgah SEZ is located in the central Mojave Desert. The earliest use of the Mojave Desert is during the Paleoindian Period sometime between 12,000 and 10,000 B.P. Sites associated with this period are located predominantly around inland pluvial lakes (notably China Lake, located northwest of the Pisgah SEZ) created during the Pleistocene, and around desert terraces, which suggests that subsistence was focused mainly on mega-fauna. This region is also interesting because of the number of pre-Paleoindian sites that have been suggested nearby. These unsubstantiated claims are a major point of contention amongst archaeologists, but the fact that so many have been suggested in the Mojave Desert (Calico Man site northwest of the SEZ, Tule Springs site near Las Vegas, Nevada, and Lake Manix, portions of which include Troy Lake in the Pisgah SEZ) make them worth mentioning here. This hunting-intensive period came to an end around 7,000 to 8,000 B.P., when the mega-fauna became extinct, likely due to intensive hunting and a warming climate; this warming climate also was one of the major contributing factors causing the pluvial lakes to recede. These early sites are characterized by the Clovis complex of fluted points, and later by the Lake Mojave complex, characterized by core and flake-based tools, crescents, choppers, planes and scrapers, and some leaf-projectile points. When Troy Lake, portions of which are within the Pisgah SEZ, was surveyed in 1965, more than 20 sites were found in the proximity of the lake; many of these were multi-component sites that contained a wide range of projectile points, affirming the chronological sequences proposed by earlier archaeologists. Newberry Cave, located to the east of the SEZ, was a single-component site that contained a sacred assemblage, characterized by perishable and non-perishable artifacts and pictographs (Rogers 1939; Jones and Klar 2007; Moratto 1984).

The Archaic Period in the Mojave Desert lasted from approximately 8,000 to 1,500 B.P. Characterized mainly by the Pinto Complex, the groups of people from this period transitioned from big-game hunting to a more broadly based subsistence economy, incorporating more hard seeds into their diets, as evidenced by the increase in milling stones and mortars and pestles in archaeological assemblages. Sites are usually found in open settings that are in well-watered areas. The Medithermal Climatic Anomaly occurred from 5,000 to 3,500 B.P., bringing about cooler temperatures and a moister climate and allowing for more intensive desert occupation during this time period. Other later complexes associated with the Archaic Period in the Mojave Desert are the Gypsum and Rose Springs Complexes, based on changes in projectile point technology and transitions in population movements (Jones and Klar 2007; Sutton 1996).

The Late Prehistoric Period began about 1,500 B.P. and extended until contact with European explorers and colonization of the area. The archaeological Patayan Complex characterizes this period, and is thought to be ancestral to the later Yuman ethnographic groups. The archaeological assemblages related to this period include paddle-and-anvil pottery (brownware ceramics and lower Colorado buff ware), bow-and-arrow technology (evidenced by smaller Cottonwood and Desert side-notched points), rock art and intaglios, bedrock milling features, a shift in burial practices from inhumation to cremation techniques, and an extensive system of trails (notably the Mohave Trail, portions of which passed near the Pisgah SEZ) along which "pot-drops," lithic debitage, and shrines are found (Norwood 1980; Jones and Klar 2007). Turquoise mines located near Halloran Springs, northeast of the Pisgah SEZ, were mined by local indigenous groups, and likely were part of the larger turquoise trade that involved areas as far as central Mexico and Chaco Canyon in New Mexico. The following section describes the cultural history of this time period in greater detail.

9.3.17.1.2 Ethnohistory

Although of differing linguistic stock, the Native Americans that inhabited the southeastern California deserts when Euro-Americans first arrived shared similar ways of life and broadly similar beliefs, norms, and values (Halmo 2003). The mountains and valleys of their shared environment provided a variety of seasonally available resources. Native American groups harvested these resources following a regular seasonal pattern. They lived in kin-based groups, or lineages, that would join together or split apart depending on the type and abundance of available resources. A pattern of seasonal camps combined with semi-permanent villages or rancherias emerged. Lineages tended to consider specific highly productive areas as their own, while the areas between them were shared with other lineages of varying ethnicity. Wild plant resources were often managed; stands of plant resources might be pruned, watered, or burned to encourage growth (Lightfoot and Parish 2009). The pattern of seasonal migration to exploit particular resources allowed the groups to adapt to changes in their subsistence base with the arrival of new cultural impulses and populations (Halmo 2003).

The various Native American ethnic groups that inhabited the southeastern California deserts each had an area that they considered their homeland, but the boundaries between these areas were not sharply drawn and fluctuated over time. Travel to hunt, trade, or just visit neighboring groups was common (Kelly and Fowler 1986; Knack 1980). The territorial claims of the different ethnic groups overlapped each other. Lineages would sometimes share territory, or one group would invite its neighbors to share an abundant resource (CSRI 2002). A network of trails, often still discernable, reflect a web of social and trade links that tied the area together and ultimately stretched from the Pacific coast to the Great Plains. As discussed in Section 9.3.18.1, the Native Americans living in southeastern California tend to view the landscape they inhabit holistically, each part intrinsically and inextricably connected to the whole. In some sense, the network of trails tied the landscape together. Trails could have sacred as well as profane aspects.

Located between the Cady and the Rodman Mountains in a valley that opens onto the Mojave Valley, the proposed Pisgah SEZ is about 6 mi (10 km) southeast of the Mojave River. While aboriginal ethnic boundaries are difficult to delineate in this sparsely populated area, Martha Knack (1980) and Alfred Kroeber (1925) considered the location to have been included in the traditional use area of the Vanyume branch of the Serrano people. The Mojave River, which flows eastward into the Mojave Desert, lies along the route of an important trail corridor. The Mohave often traveled and traded along the corridor and consider the area within their traditional use area. It is likely that it was an area used jointly by the surrounding Tribes including the Kawaiisu, who ranged as far south as the Mojave River, and the Chemehuevi as well.

Vanyume

Little is known of the Vanyume. Their population was small (Kroeber 1925) and dwindled rapidly in the early nineteenth century. They are thought to have become extinct before the beginning of the twentieth century. They are often thought of as the desert branch of the Serrano (Knack 1980), with whom they share linguistic ties. Politically, however, they were distinct, having friendly relations with the Mohave and the Chemehuevi, who were enemies to most Serrano (Bean and Smith 1978). The Vanyume resided in small groups based along the lower Mojave River and its sinks. Like their neighbors to the east, they lived in small kinship-based groups, less politically elaborated than their Serrano cousins, who are discussed in more detail in Section 9.2.17.1. They traveled in small bands to exploit food resources, following a pattern tied to the season and local rainfall. These groups joined or split apart with the abundance of the food resource they were harvesting (Knack 1980). Early Spanish explorers reported that the Vanyume relied on mesquite, screwbeans, and tule roots for food, and though normally unclothed, possessed rabbit-skin and otter-skin blankets (Kroeber 1925).

The Serrano had little contact with the Spanish and were not successfully missionized; however, missionization and the spread of European diseases among neighboring Tribes resulted in significant reductions in the native population, possibly allowing the Vanyume to retreat to more lush northern mountains (Knack 1980). The Vanyume continued to dwindle. Any surviving Vanyume descendants most likely have merged with Serrano or other surrounding groups.

Mohave

The Mohave were primarily at home along the Colorado River, from time to time reaching as far south as Blythe, but they travelled and traded widely, following the Mojave River to visit coastal Tribes. They are likely to have travelled through or near the Pisgah SEZ on their journeys to and from the coast. They had sprawling settlements, rather than villages, with houses situated on low hills above the floodplain.

Their traditional use area claims extend far beyond the valleys of the Colorado River, reflecting their propensity for travel. They claim all the Mojave Desert and the land as far south as the Turtle, Granite, and Eagle Mountains, and as far west as the Tehachapi and San Gabriel Mountains (CSRI 2002), thus including the SEZ. This larger range was where they traded, hunted, and gathered to supplement their planted crops and the fish they took from the river. They are likely to have traded, hunted, and gathered in the Pisgah SEZ area. They were less reliant on hunting and gathering than the Chemehuevi, who hunted and gathered in much of the same area (Knack 1980).

Chemehuevi

The Chemehuevi are a Southern Paiute group who first entered the Parker and Blythe Valleys along the Colorado at the invitation of their allies, the Mohave, sometime between 1825 and 1830. Although partially settled along the river, they retained their ties to mountains and valleys of the Great Basin. Those retaining a desert way of life have been called Desert Chemehuevi (*Tiiranniwiwi*). The Tiiranniwiwi are said to have ranged well west of the eastern Mojave in search of particular resources and may have moved farther west when missionization and the spread of European diseases resulted in the depopulation of some areas (Knack 1980). They may have been present periodically in the Pisgah SEZ.

In the late 1860s, hostilities erupted between the Mohave and Chemehuevi, and part of the Chemehuevi moved west to join Cahuilla and Serrano villages near Twentynine Palms. In 1874, the Office of Indian Affairs set aside part of the Mohave reservation along the Colorado River for the Chemehuevi, but many did not want to return. In 1907, a separate reservation was established for them north of Parker, Arizona (Kelly and Fowler 1986).

Chemehuevi settlements were scattered, and band size varied with the season and available water, plant, and animal resources. Dwellings varied from pole structures covered with brush to rock shelters in the desert areas to earth-covered huts, often with open fronts, adopted from the Mohave along the Colorado River. Other items of Mohave material culture were likewise adopted, including ceramic styles, square metates (grinding stones), storage platforms, and personal adornment (Kelly and Fowler 1986).

The relations between the Chemehuevi and neighboring Tribes were mostly amicable. They maintained a trading relationship with the Cahuilla. Groups of Chemehuevi would travel as far west as the coast to trade for shells and as far east as the Hopi mesas. They were involved in a trade network that stretched from the Channel Islands to the Gila River Valley and the Great Plains, with the potential to bring material culture from some distance away to the Chemehuevi homeland.

Kawaiisu

The territory occupied by the Kawaiisu straddled the southern portion of the Sierra Nevada Mountains and extended into the Mojave Desert to the Mojave River. The proposed Pisgah SEZ lies close to the southern extent of their traditional use area. They are Southern Numic speakers and some linguists are of the opinion that due to their relative isolation from other Numic-speaking groups, their dialect of Southern Numic was a separate language (Goss 1966). It has been suggested that theirs was the central area from where the Proto-Numic and Southern Numic language groups dispersed. Based on this evidence, it is thought that the Kawaiisu have occupied the area for the last 2,000 years (Zigmond 1986).

Ethnographic accounts of the Kawaiisu suggest the group was peaceful and neither violent nor warlike. Tribal unity was not a major factor in the Kawaiisu cultural mindset, and consequently the chieftainship was recognized but only through tacit acknowledgment by the people. Several leaders could have been accepted in local areas, the most important qualifications for chieftainship being wealth and generosity. This limited political organization was also reflective of their social organization, as bands of related family groups were the most extensive form of social organization (Zigmond 1986). Acorns were easily accessible in the region and it was this resource that was often traded, notably with Western Shoshone for obsidian and salt and with the Southern Valley Yokuts Tribes (Garfinkel and Schiffman 1981). The Kawaiisu congenial nature is evidenced in their participation of intertribal game drives, in which nearby Tribal groups (Tubatulabal, Chumash, and Yokuts) would contribute in large hunts, notably for antelope. Because acorns were the staple crop for the Kawaiisu, typical desert plants such as mesquite and screwbean did not factor into the diet as heavily as in other desert-residing Tribes, suggesting that the Kawaiisu were a unique hybrid California-desert and Great Basin Tribal group due to their close proximity and their ability to avail themselves of both resource zones so easily (Zigmond 1986).

9.3.17.1.3 History

European explorers first entered the southeastern California deserts in the sixteenth century. Early explorers of Alta California reached the Colorado River by way of the Gulf of Mexico and proceeded upstream past the confluence of the Gila River, but they explored little of the interior deserts. For the next 200 years Spanish penetration of the interior deserts was intermittent, resulting in a prolonged protohistoric period (see Sections 9.3.17.1.1 and 9.3.17.1.2). Juan Bautista de Anza crossed the Colorado River with the assistance of the Quechan on his way to Monterey in 1774. His route, which is located well south of the Pisgah SEZ, near the border of California and Mexico, became the main travel corridor between Arizona and central California in the 1800s.

The Mojave Desert has a history of being a corridor, both prehistorically and historically. Several trails and railroads passed through the area; however, the lack of water caused problems in traversing the arid desert. The Old Spanish Trail refers to several different trails that traversed the Mojave Desert, utilized for exploratory, commercial, and settlement interests. Parts of the Old Spanish Trail likely followed parts of the prehistoric Mohave Trail, but there were divergences in both and it is difficult to determine an exact extensive route for either trail. Later referred to as Government Road, water holes were all nearly one day’s travels apart, causing several groups to perish along the treacherous desert crossing. Beale’s Wagon Road, an historic trail that ran along the 35th parallel and intersected parts of the Mohave Trail, was used for a short period of time with the aid of camels to assist wagon trains in traveling from the Colorado River to Los Angeles, but because it constantly encountered hostile Mojave groups the trail was abandoned in 1861. Another trail that ran north of the Old Spanish Trail, referred to as the Mormon Trail, connected Salt Lake City to the Mormon-established town of San Bernardino, but like the other trails various routes were used. Along the Mormon Trail was Salt Spring, where the first confirmed gold strike in San Bernardino County took place in 1849 (von Till Warren 1980).

Mining has been the most important commercial industry in San Bernardino County, with 1900 through 1919 referred to as “The Great Years” for mining in the area. In 1863, prior to this period, silver was discovered, but copper, lead, zinc, and gold were also mined in the area, and during both World Wars chromium, manganese, tungsten, and vanadium were mined there. More recently, clay, talc, cinders, and aggregate mining (sand and gravel), have become more profitable resources to mine. There are three mines in relatively close proximity to the Pisgah SEZ: Black Butte Mine to the east, Pisgah Mine to the south, and Logan Mine to the north. These sites consist of open pit mines, borrow pits, and open mines (von Till Warren 1980; Shumway et. al. 1980).

Railroad development in the area facilitated the mining operations and made water more readily available. The BNSF Railroad, historically known as the Atlantic and Pacific Railroad, and later the Atchison, Topeka, and Santa Fe Railroad, passes directly through the Pisgah SEZ. Sidings associated with this rail line were constructed in Troy, Hector, Pisgah, and Lavic, all locations in close proximity to the Pisgah SEZ. A water tank was constructed at Newberry Springs, east of the SEZ, and was the primary source of water for the railroad. Prior to the construction of the railroad, there were few people who lived in the area except for those associated with the mining industry. With the coming of the railroad, towns were built and populations were sustained at several nearby locations, notably at Ludlow and Newberry Springs.

As southern California began to grow, its need for resources also increased. Consequently, natural gas and transmission lines had to be built to facilitate this growth. With the construction of the Hoover Dam in 1937, several transmission lines crossed the SEZ and a substation was built in the proposed Pisgah SEZ to provide power to the southern California area.

The Mojave Desert provides ideal conditions for military use. The vast open spaces, lack of population, and access to rail lines have caused the military to seek use of the Desert for several of its operations. In 1860 a fort was built at Camp Cody, located northwest of the SEZ, in an effort to suppress Paiute Indian attacks. More recently, military installations have been constructed at Twentynine Palms, south of the SEZ, and Fort Irwin, north of the SEZ. In 1942, General George Patton identified an 18,000 mi^2 (46,800 km^2) area, a vast area east of the SEZ, for use in training troops for combat in the North African Desert during WWII. While this Desert Training Area did not enter into the SEZ, traffic was significantly increased throughout the SEZ due to the construction and operation of this and other military operations.

With the widespread adoption of the automobile after World War I, the need for roads that were capable of handling automobile traffic rose. In the early twentieth century, travel in and around the proposed Pisgah SEZ was basically restricted to prehistoric trails and roads that were created by the railroads to aid in their construction. The National Auto Trail System was an informal network of automobile routes that were marked by local organizations, and a part of this Trail System was the Old National Trails Highway. This highway was established in 1912 in the vicinity of old wagon roads and adjacent to the Santa Fe Railroad tracks. In 1916, the Federal Highway Aid Act was passed, helping to fund the increasingly necessary road system; due to the increased traffic on the roads, the section of the road in the vicinity of the proposed Pisgah SEZ had been widened and oiled or covered with gravelly sand by the 1920s. By, 1926 the Old National Trails Highway in the Mojave Desert had been designated U.S. Route 66. It became one of the first highways to provide a route of travel from Chicago to the Pacific Ocean, a major artery of the National Highway System. Realignment of U.S. Route 66 occurred in the 1930s, putting the road on the alignment to which it currently adheres. The new alignment eliminated steep grades and straightened the road, allowing for faster speeds. The section of the road from Needles, California, to Los Angeles, California, was the most heavily traveled section of the highway, which encouraged paving of the road surface along this route in 1934, while the rest of the highway was paved by 1938. With the establishment of this extensive road system, thousands of businesses, including grocery stores, service stations, restaurants, motels, and tourist attractions, opened along the route to provide services to those travelling. These businesses and the road itself became an integral part of culture of America during the 1920s through the 1960s, as evidenced by its mention in both songs and literature (Stirling Energy Systems 2008).

9.3.17.1.4 Traditional Cultural Properties—Landscape

The Tribes of southeastern California tend to take a holistic view of the world; they see the features of their environment as an interconnected whole imbued with a life force. Prominent features may be seen as places of power—sacred places. High hills and mountains tend to be regarded as sacred, while some peaks have special status. Other features that tend to be regarded as sacred include caves, certain rock formations, springs, and hot springs. Revered locations include panels of rock art, evidence of ancestral settlements, arranged-rock sites, burial or cremation areas, and systems of trails. Sacred sites are often seen as places of power where offerings are left (Halmo 2003). Tribes see themselves as exercising divinely given responsibilities of stewardship over the lands where they believe they were created and as retaining a divine birthright to those lands. Specific mountain peaks are seen as points of emergence associated with creation stories. Hot springs and petroglyphs panels were thought to be associated with supernatural power; hot springs were thought to have healing powers, and petroglyphs panels were associated with the shaman's spirit helpers (Knack 1980). During consultation with the BLM regarding the Calico Solar Power Project, part of which lies within the proposed SEZ, Tribal representatives found that the prehistoric rock cluster features and lithic scatters that had been determined eligible for the NRHP were important components of the Native American cultural landscape (BLM and CA SHPO 2010).

According to a Sacred Lands File Search through the California Native American Heritage Commission (NAHC), no sacred sites were identified within the proposed Pisgah SEZ (Singleton 2010).

9.3.17.1.5 Cultural Surveys and Known Archaeological and Historic Resources

At least 19 previous surveys have been conducted in proposed Pisgah SEZ, twelve of which were linear pedestrian surveys, and two of which were associated with the Calico Solar Power Project (previously the Stirling Solar One Project) APE. The surveys resulted in the recording of 146 archaeological sites and ten architectural resources. Of the 146 archaeological sites, 108 sites need further evaluation regarding their NRHP and California Register of Historic Places (CRHR) eligibility, and two of the ten historic structures are considered NRHP eligible.

Of the 108 sites that require further evaluation, 100 are prehistoric in nature, five are historic, and three are multi-component sites (Stirling Energy Systems 2008).

There are two historic resources that intersect the Pisgah SEZ and are NRHP eligible: U.S. 66, also known as National Old Trails Highway, and the Southern California Edison (SCE) 220-kV transmission line built in 1937. Portions of Old Route 66 are found throughout the SEZ. Most are in poor condition; however, its significance as an early automobile route across the Mojave Desert lends itself to its consideration for NRHP eligibility. Associated with U.S. 66 are historic refuse scatters, and outside the Pisgah SEZ locations along the road that were used by travelers, such as restaurants and motels. The SCE transmission line was constructed to bring power from the Hoover Dam to Southern California, and its significance lies in the fact that it is one of the earliest transmission lines in the area from the Hoover Dam to Southern California.

There are three prehistoric archaeological sites and two multi-component sites that are located either in or within 5 mi (8 km) of the proposed Pisgah SEZ that are also potentially eligible for inclusion on the NRHP. Four of these sites are located in close proximity to Troy Dry Lake, and the other is in the lava fields southwest of the SEZ (Plog et al. 1989; Norwood 1980).

One of these sites, located on the edge of the Troy Dry Lake bed, is a multi-component site consisting of a prehistoric lithic scatter, ground stone fragment, and two projectile points, and historic railroad camp structures, with associated glass, metal, ceramics, and building materials. This site could provide valuable information that has not been collected about historic railroad camps, as few camps have been analyzed in the Mojave Desert region. Another multi-component site, located southeast of Troy Dry Lake below Newberry Cave, consists of a prehistoric artifact scatter and an historic trash scatter and buildings constructed of homemade bricks. The prehistoric scatter is made up of lithic flakes, projectile points, cores, bifaces, scrapers, ground stone, and ceramics. The historic component consists of porcelain, ceramics, hand-blown and mold-blown bottle glass, magnesia glass, and metal and shell buttons, along with the aforementioned structure. The historic component could provide critical information related to settlement patterns, living conditions, and possibly trade routes among various ethnic groups that inhabited the Mojave Desert in historic times. The prehistoric component is valuable because analysis of the lithic material could serve to indicate variation in the manufacture of lithic material compared to other archaeological assemblages in the region (Plog et al. 1989).

The dune area of Troy Dry Lake houses one of the other potentially eligible sites, a prehistoric artifact scatter consisting of lithic flakes, ceramics, and fire-affected rock that may be the remains of a hearth. The location of this site suggests that those who occupied it used the resources of the lake environment, the value of the site being in the potential of the assemblage to indicate prehistoric environmental exploitation and to contribute to the overall chronological sequence of the region. The other site with potential eligibility for listing in the NRHP is a vast (24 acres [0.1 km^2]) lithic scatter consisting of over 980 artifacts, which, if analyzed, could contribute to the regional picture of lithic production and specialization and to the chronological sequence as determined by lithic material (Plog et al. 1989).

A rock shelter, located southwest of the SEZ in the lava fields, is also a potential NRHP site. The site consists of lithic flakes and there is potential for subsurface remains to be present.

The possibility of subsurface material could indicate cultural and temporal sequences and contexts and lends to the site's potential NRHP inclusion (Norwood 1980).

The BLM has designated several locations within relatively close proximity to the proposed Pisgah SEZ as ACECs because of their significant cultural value. These include the Rodman Mountains Cultural Area, 6 mi (10 km) to the south, known for its petroglyph panels; the Calico Early Man Site, 12 mi (19 km) to the northwest, and the Mesquite Hills/Crucero ACEC, 18 mi (29 km) to the northeast, for their prehistoric resources; and the Manix ACEC, 6 mi (10 km) north of the SEZ, for its paleontological and cultural resources. The Rainbow Basin/Owl Canyon ACEC, 27 mi (44.5 km) to the northwest, includes prehistoric, geological and paleontological resources, and the Cronese Basin, 20 mi, (33 km) to the north, includes both cultural and wildlife resources.

National Register of Historic Places

There are no historic properties listed in the NRHP within the SEZ or within 5 mi (8 km) of the SEZ. However, as stated above, both U.S. 66 and the SCE transmission line are NRHP eligible, as are the four archaeological sites associated with Troy Dry Lake and the rock shelter.

9.3.17.2 Impacts

Direct impacts on significant cultural resources could occur in the proposed Pisgah SEZ; however, as stated in Section 9.3.17.1, further investigation is needed in a number of areas. A cultural resource survey of the entire area of potential effect (APE) of a proposed project would first need to be conducted to identify archaeological sites, historic structures and features, and traditional cultural properties, and an evaluation would need to follow to determine whether any are eligible for listing in the NRHP. Numerous sites, both prehistoric and historic, have been identified within the SEZ. Possible impacts from solar energy development on cultural resources that are encountered within the SEZ or along related ROWs, as well as general mitigation measures, are described in more detail in Section 5.15.

Programmatic design features to reduce water runoff and sedimentation would reduce the likelihood of indirect impacts resulting from erosion outside of the SEZ boundary on cultural resources (including along ROWs).

No new access roads or transmission lines have been assessed for the proposed Pisgah SEZ, assuming existing corridors would be used; impacts on cultural resources related to the creation of new corridors would be evaluated at the project-specific level if new road or transmission construction or line upgrades are to occur.

Because of the interconnectedness of the landscape in Native American cosmology, a change in one part affects the whole; thus damage to one part of an important cultural landscape would affect all of it. The proposed Pisgah SEZ is close to or within the important Mohave Trail travel corridor. It also includes archaeological evidence of repeated if intermittent use. To date, no culturally important geophysical features have been identified in the area surrounding Pisgah; however, it is possible that features will be identified during continued consultation with the Tribes. Native Americans have expressed concern over the visual impacts of development on segments of trails and features that have religious importance (Halmo 2003). Development that is visible from the trails may be considered intrusive. The Pisgah SEZ is not pristine wilderness; it is crossed by a major interstate highway, a railroad, pipelines, transmission lines, and other roads. However, the construction of an extensive solar energy facility would very likely have more visual impact on the landscape than already exists.

Native Americans have also expressed concern over other impacts likely to accompany development (Halmo 2003). The presence of an industrial facility and the associated increase in traffic and workers are likely to have a negative impact on the qualities that render a site sacred. An increase in the number of people in the area would increase the potential for damage to panels of rock art and the disturbance of burials and archaeological sites. While the development of the Pisgah SEZ would necessarily increase the number of people coming to and working in the SEZ, this impact should be greatest during the construction and decommissioning phases of a facility. The operation of a solar facility would require fewer personnel (see Section 9.3.19.2.2).

9.3.17.3 SEZ-Specific Design Features and Design Feature Effectiveness

Programmatic design features to mitigate adverse effects on significant cultural resources, such as avoidance of significant sites and features and cultural awareness training for the workforce, are provided in Appendix A, Section A.2.2.

SEZ-specific design features would be determined in consultation with the California SHPO and affected Tribes. Consultation efforts should include discussions on significant archaeological sites and traditional cultural properties and on sacred sites and trails with views of the proposed SEZ. SEZ-specific design features could include the following:

- Significant historic and prehistoric sites in the vicinity of Troy Lake should be avoided.

- Areas of significant prehistoric remains within the SEZ that are identified through the Calico Solar Power Project (to date an area including a 400-ft [122-m] buffer and in some instances fencing [BLM and CA SHPO 2010]) should be avoided.

9.3.18 Native American Concerns

Native Americans share many environmental and socioeconomic concerns with other ethnic groups. This section focuses on concerns that are specific to Native Americans and to which Native Americans bring a distinct perspective. For a discussion of issues of possible Native American concern shared with the population as a whole, several sections in this PEIS should be consulted. General topics of concern are addressed in Section 4.16. Specifically for the proposed Pisgah SEZ, Section 9.3.17 discusses archaeological sites, structures, landscapes, trails, and traditional cultural properties; Section 9.3.8 discusses mineral resources; Section 9.3.9.1.3 discusses water rights and water use; Section 9.3.10 discusses plant species; Section 9.3.11 discusses wildlife species, including wildlife migration patterns; Section 9.3.13 discusses air quality; Section 9.3.14 discusses visual resources; and Sections 9.3.19 and 9.3.20 discuss socioeconomics and environmental justice, respectively. Issues of human health and safety are discussed in Section 5.21.

The California Native American Heritage Commission (NAHC) has been consulted to determine which Tribes have traditional associations with the California SEZs. All federally recognized Tribes with traditional ties to the Pisgah SEZ have been contacted and given the opportunity to express their concerns regarding solar energy development. Table 9.3.18-1 lists the Tribes contacted with traditional ties to the SEZs in southeastern California. Appendix K

TABLE 9.3.18-1 Federally Recognized Tribes with Traditional Ties to the Southeastern California SEZs

Tribe	Location	State
Agua Caliente Band of Cahuilla Indians	Palm Springs	California
Cabazon Band of Cahuilla Mission Indians	Indio	California
Cahuilla Band of Mission Indians	Anza	California
Campo Kumeyaay Nation	Campo	California
Chemehuevi Indian Tribe	Havasu Lake	California
Cocopah Indian Tribe	Somerton	Arizona
Colorado River Indian Tribes	Parker	Arizona
Ewiiaapaayp Band of Kumeyaay Indians	Alpine	California
Fort Mojave Indian Tribe	Needles	California
La Posta Band of Kumeyaay Indians	Boulevard	California
Los Coyotes Band of Cahuilla & Cupeno Indians	Warm Springs	California
Manzanita Band of Kumeyaay Indians	Boulevard	California
Morongo Band of Mission Indians	Banning	California
Quechan Indian Tribe of the Fort Yuma Reservation	Yuma	Arizona
Salt River Pima-Maricopa Indian Community	Scottsdale	Arizona
San Manuel Band of Mission Indians	Patton	California
Soboba Band of Luiseño Indians	San Jacinto	California
Sycuan Band of the Kumeyaay Nation	El Cajon	California
Torres-Martinez Desert Cahuilla Indians	Thermal	California
Twenty-Nine Palms Band of Mission Indians	Coachella	California
Viejas Band of Kumeyaay Indians	Alpine	California

lists all federally recognized Tribes contacted for this PEIS. The concerns Native Americans have expressed about energy development projects are summarized in the next section. Their comments provide important insights into their concerns over energy development in the area.

9.3.18.1 Affected Environment

As discussed in Section 9.3.17.1.2, the territorial boundaries of the Tribes that inhabited the Mojave and Colorado Deserts appear to have been fluid over time. At times they overlapped, and where resources were abundant they were shared among the Tribes. The Pisgah SEZ includes the dry Troy Lake and an extensive lava flow. The eastern end of the SEZ is located 6.2 mi (10 km) southeast of the Mojave River, which until recently maintained an intermittent surface flow. A major traditional Native American travel corridor, the Mohave Trail, followed the river. Extensive artifact scatters along the eastern shore of Troy Lake and artifacts associated with a rock shelter in the lava flow about 1 mi (1.6 km) west of the SEZ indicate that the area was repeatedly, but intermittently, used by Native Americans. While ethnographic data for the area are scant, the SEZ appears to lie within the traditional use area of the Vanyume branch of the Serrano people (Knack 1980). The Vanyume were encountered along the Mojave River by the earliest Spanish explorers in the area (Kroeber 1925). However, as a major travel corridor it is likely that the area was regularly traversed by neighboring peoples, including the Mohave, the Chemehuevi, and the Kawaiisu. In the 1950s, the Indian Claims Commission found territorial boundaries in the area too difficult to differentiate and judged the area to be the common territory of the “Indians of California;” it is so shown on maps of judicially established Native American land claims (Royster 2008). The Indians of California category was created by Congress to accommodate the claims of California Native Americans who had lost their identity as distinct tribes, bands, or villages due to the arrival and policies of Euro-Americans (Indian Claims Commission 1958).

9.3.18.1.1 Territorial Boundaries

Vanyume—Serrano

The Pisgah SEZ lies just north of the area claimed for the Serrano before the Indian Claims Commission in the 1950s. The northern boundary of their claim ran from the Cajon Pass to Ludlow, California, in an irregular line (CSRI 2002). Following Kroeber (1925), most researchers have placed the linguistically related Vanyume bands in the area north of the Serrano (Bean and Smith 1978). The Vanyume were never a large group and had disappeared by the end of the nineteenth century, by which time any remnants of the Tribe had probably been absorbed with Serrano into the remaining “Mission Indian” communities.

Mohave

The territory claimed by the Mohave before the Indian Claims Commission extends from the Colorado River to the San Gabriel Mountains, and includes all of the Mojave Desert and the

Mojave River (CSRI 2002), thus including the SEZ. While the commission granted exclusive claim only to those portions located along Colorado River, the Mohave, known as travelers and traders, made use of the Mohave Trail along the Mojave River and very likely passed through the SEZ. Mohave descendants occupy the Fort Mojave Indian Reservation near Needles, California, and may be found on the reservation of the Colorado River Indian Tribes.

Chemehuevi

The Chemehuevi were eastern neighbors of the Vanyume, with whom they were on friendly terms. Their territorial claims extend as far west as the Bristol Mountains (CSRI 2002). As travelers and friends of the Vanyume, it is likely that they too were familiar with the Mohave Trail and the surrounding mountains and valleys, including the Pisgah SEZ. Chemehuevi descendants occupy the Chemehuevi Reservation and share the Colorado River Indian Tribes Reservation with the Mohave and other Tribes.

Kawaiisu

The Kawaiisu were kin-based bands who spoke a Southern Numic language and inhabited the southern slopes of the Sierra Nevada, with access to both San Joaquin Valley and Mojave Desert resources. Regarded as predominantly peaceful, they are thought to have ranged seasonally as far south as the Mojave River. Kawaiisu culture appears to have disappeared in the 1960s. Kawaiisu descendants are few and scattered across southern California (Goss 1966; Zigmond 1986).

9.3.18.1.2 Plant Resources

The plant resources utilized by Native Americans in the Mojave Desert tend to be sparse and widely distributed, making those resources that do exist more valuable. The regions surrounding the SEZ are too dry for unirrigated agriculture but support some of the many desert plants used by the Tribes (Knack 1980).

The plant communities observed at the Pisgah SEZ are discussed in Section 9.3.10. There are three major plant communities present on the SEZ: North American Warm Desert Playa, North American Warm Desert Volcanic Rockland, and Sonora-Mojave Creosotebush-White Bursage Desert Scrub. There are also smaller areas of North American Warm Desert Bedrock, Cliff, and Outcrop; Sonora-Mojave Mixed Salt Desert Scrub; and North American Warm Desert Active and Stabilized Dune plant communities (NatureServe 2008). The dominant plants across most of the SEZ appear to be creosotebush and bursage, with saltbush in the lakebed.

Native American populations have traditionally made use of hundreds of native plants. However, the plants that dominate the Mojave Desert, creosotebush, and bursage, are not edible. Creosote was used as medicinal herb and bursage not at all (Knack 1980). Table 9.3.18.1-1 lists plants often mentioned as important by Native Americans that were either observed at the Pisgah

TABLE 9.3.18.1-1 Plant Species Important to Native Americans Observed or Likely To Be Present in the Proposed Pisgah SEZ

Common Name	Scientific Name	Status
Food		
Beavertail Prickly Pear Cactus	*Opuntia basilaris*	Possible
Boxthorn	*Lycium* spp.	Possible
Buckwheat	*Eriogonum* spp.	Possible
Jumping Cholla	*Opuntia bigelovii*	Possible
Mesquite	*Prosopis* spp.	Possible
Rice Grass	*Orizopsis* spp.	Possible
Saltbush	*Atriplex* spp.	Observed
Medicine		
Creosotebush	*Larrea tridentata*	Observed
Mormon Tea	*Ephedra nevadensis*	Possible
Unspecified		
Brittlebush	*Encolia farinosa* sp.	Observed
Ocotillo	*Fouquieria splendnens*	Possible

Sources: Field visit; Lightfoot and Parrish (2009); NatureServe (2008).

SEZ or are possible members of the cover-type plant communities identified at the SEZ. In the table, plants are grouped by use category, but an individual plant is not necessarily confined to one category. The plants listed are the dominant species; however, other plants important to Native Americans could occur in the SEZ, depending on local conditions and the season.

Of the food plants, only saltbush was observed at the SEZ. Mesquite, among the most important food plants in the desert, could possibly exist on the stabilized dunes, but the SEZ is not prime mesquite habitat. Other possible food plants for these communities include beavertail cactus, buckwheat, boxthorn, and jumping cholla. Saltbush, rice grass, and buckwheat seeds can be harvested, processed, and eaten; beavertail cactus produces a prickly pear fruit; and the new growth of jumping cholla can be boiled and eaten (Knack 1980; Lightfoot and Parish 2009).

The proposed Pisgah SEZ includes other plants useful to Native Americans. The leaves of the dominant creosotebush are widely made into tea for medicinal purposes, as is a tea made from *Ephedra* spp., or Mormon tea (Lightfoot and Parish 2009). While some of the plant species present at the SEZ were used traditionally by Native Americans, they do not appear to be especially plentiful. Food sources in particular appear to be scant. It is likely that better sources of these plants existed elsewhere. When the Mojave River was flowing, other resources would have been available closer to its bed.

9.3.18.1.3 Other Resources

There is some potential for food species in or near the Pisgah SEZ, particularly when water is available in the Mojave River. The largest of these is the bighorn sheep that ranged through the surrounding mountains. Smaller game include black-tailed jackrabbits, desert cottontails, kangaroo rats, and desert wood rats. Gambel's quail and mourning doves, both snared by Native Americans, are also possible in this habitat (Knack 1980; Lightfoot and Parrish 2009). See Section 9.3.11 for a more detailed discussion of the wildlife present or likely in the SEZ. Table 9.3.18.1-2 provides a representative list of animals important to Native Americans likely to occur within the proposed Pisgah SEZ.

As long-time desert dwellers, Native Americans have a great appreciation for the importance of water in an arid environment. They have expressed concern over the use and availability of water for solar energy installations (Halmo 2003; Jackson 2009). One of the main concerns regarding past industrial developments planned for the region was the contamination of ground water (CSRI 1987).

TABLE 9.3.18.1-2 Animal Species used by Native Americans whose Range Includes the Proposed Pisgah SEZ

Common Name	Scientific Name	Status
Mammals		
Bats	Various species	All year
Badger	*Taxidea taxus*	All year
Bighorn sheep	*Ovis Canadensis*	All year
Black-tailed jack rabbit	*Lepus californicus*.	All year
Bobcat	*Lynx rufus*	All year
Coyote	*Canis latrans*	All year
Desert cottontail	*Silvilagus audubonii*	All year
Squirrels	*Spermophilus* sp. & *Ammospermophilus* sp.	All year
Woodrats	*Neotoma* spp.	All year
Birds		
Gambel's quail	*Callipepla gambelii*	All year
Greater roadrunner	*Geococcyx californiensus*	All year
Mourning dove	*Zenaida macrocura*	All year
Turkey vulture	*Cathartes aura*	Sommer
Reptiles		
Desert tortoise	*Gopherus Agassizii*	All year
Rattlesnakes	*Crotalus* spp.	All year

Sources: Lightfoot and Parrish (2009); Fowler (1986); Zigmund (1986).

In addition, Native Americans have expressed concern over ecological segmentation, that is, development that fragments animal habitat and does not provide corridors for movement. They would prefer that solar energy development take place on land that has already been disturbed, such as abandoned farmland, rather than on undisturbed ground (Jackson 2009).

9.3.18.2 Impacts

To date, no comments have been received from the Tribes specifically referencing the proposed Pisgah SEZ. However, general concerns regarding solar energy development in the deserts of southeastern California have been expressed. In a response letter, the Quechan Indian Tribe of Fort Yuma stresses the importance of evaluating impacts of development at a landscape scale (Jackson 2009).

The impacts that would be expected from solar energy development within the Pisgah SEZ on resources important to Native Americans fall into two major categories: impacts on the landscape and impacts on discrete localized resources.

Landscape-scale impacts are those caused by the presence of an industrial facility within a sacred or culturally important landscape that includes sacred geophysical features tied together by a network of trails. Impacts may be visual—the intrusion of an industrial feature in sacred space; or audible—noise from the construction, operation, or decommissioning of a facility detracting from the culturally important character of the site. As consultation with the Tribes continues and project-specific analyses are undertaken, it is possible that Native Americans will express concerns over potential visual, noise and other effects of solar energy development within the SEZ on a culturally important landscape. To date, no features of this type have been identified for the Pisgah SEZ. The Pisgah SEZ is already the site of modern development. A freeway (I-40), a railroad, energy pipelines, transmission lines, a substation, and other roads all cross the SEZ. The area is not pristine and may be considered already disturbed by the Tribes.

Localized effects are possible both within the SEZ and in adjacent areas. Within the SEZ these effects would include destroying or degrading important plant resources, destroying the habitat of and impeding the movement of culturally important animal species, and destroying archaeological sites and burials. Any ground-disturbing activity associated with the development within the SEZ has the potential for destruction of localized resources. Tribes consulted as part of environmental and cultural reviews for the planned Calico Solar Power Project, which lies partly within the proposed SEZ, found that significant prehistoric sites would be adversely affected by development of the solar facility. The design of the Calico facility was altered to avoid these resources (BLM and CA SHPO 2010). However, since utility-scale solar energy facilities cover large tracts of ground, it is unlikely that avoidance of all resources would be possible, even taking into account the implementation of programmatic design features. Programmatic design features (see Appendix A, Section A.2.2) assume that the necessary cultural surveys, site evaluations, and Tribal consultations will occur.

Some plants traditionally used by Native Americans grow within the proposed SEZ and would unavoidably be disturbed by the construction of a utility-scale solar power facility.

However, as discussed in Section 9.3.10, impacts on most plant communities are expected to be small in most cases, since these communities are widespread in the area. The cultural importance of impacts on specific stands must be determined through consultation with the affected Tribe(s). As discussed in Section 9.3.11, the affected animal species and habitat are widely distributed in the area. Impacts on these species are likely to be small as long as programmatic design features are implemented.

Implementation of programmatic design features, as discussed in Appendix A, Section A.2.2, should eliminate impacts on Tribes' reserved water rights and the potential for groundwater contamination issues.

Whether there are any issues relative to socioeconomics, environmental justice, or health and safety relative to Native American populations is yet to be determined.

9.3.18.3 SEZ-Specific Design Features and Design Feature Effectiveness

Programmatic design features to mitigate impacts of potential concern to Native Americans, such as avoidance of sacred sites, water sources, and tribally important plant and animal species, are provided in Appendix A, Section A.2.2.

The development of solar energy facilities in the state of California requires developers to follow CEC guidelines for interacting with Native Americans, in addition to federal requirements (CEC 2009a). Developers must obtain information from California's NAHC on the presence of Native American sacred sites in the project vicinity and a list of Native Americans who want to be contacted about proposed projects in the region. Table 9.3.18.3-1 lists the Tribes recommended for contact by the NAHC.

TABLE 9.3.18.3-1 Federally Recognized Tribes Listed by the NAHC to Contact Regarding the Proposed Pisgah SEZ

Tribe	Location	State
Agua Caliente Band of Cahuilla Indians	Palm Springs	California
Chemehuevi Indian Tribe	Havasu Lake	California
Colorado River Indian Tribes	Parker	Arizona
Cocopah Indian Tribe	Somerton	Arizona
Fort Mojave Indian Tribe	Needles	California
Morongo Band of Mission Indians	Banning	California
Quechan Indian Tribe of the Fort Yuma Reservation	Yuma	Arizona
San Manuel Band of Mission Indians	Patton	California
Torres-Martinez Desert Cahuilla Indians	Thermal	California
Twentynine Palms Band of Mission Indians	Coachella	California

Source: (Singleton 2010).

The need for and nature of SEZ-specific design features regarding potential issues of concern would be determined during government-to-government consultation with affected Tribes. The Quechan Tribe has suggested that the clustering of large solar energy facilities be avoided; that priority for development be given to lands that have already been disturbed by agricultural or military use; and that the feasibility of placing solar collectors on existing structures be considered, thus minimizing or avoiding the use of undisturbed land (Jackson 2009).

Mitigation of impacts on archaeological sites and traditional cultural properties is discussed in Section 9.3.17.3, in addition to the programmatic design features for historic properties discussed in Appendix A, Section A.2.2.

9.3.19 Socioeconomics

9.3.19.1 Affected Environment

This section describes current socioeconomic conditions and local community services within the ROI surrounding the proposed Pisgah SEZ. The ROI is a single-county area comprising San Bernardino County in California. It encompasses the area in which workers are expected to spend most of their salaries and in which a portion of site purchases and non-payroll expenditures from the construction, operation, and decommissioning phases of the proposed SEZ facility are expected to take place.

9.3.19.1.1 ROI Employment

In 2008, employment in the ROI stood at 806,434 (Table 9.3.19.1-1). Over the period between 1999 and 2008, the annual average employment growth rate in San Bernardino County was 1.2%, slightly higher than the average rate for California (0.9%).

In 2006, the service sector provided the highest percentage of employment in the ROI at 45.4%, followed by wholesale and retail trade with 21.1% (Table 9.3.19.1-2). Smaller employment shares were held by manufacturing (11.4%) and construction (7.7%).

9.3.19.1.2 ROI Unemployment

Over the period 1999 to 2008, the average unemployment rate in San Bernardino County was 5.6%, slightly lower than the average rate for California (5.8%) (Table 9.3.19.1-3). The unemployment rate for the first 10 months of 2009 (13.1%) contrasts with the rate for 2008 as a whole (8.0%). The average rate for California as a whole (11.6%) was also higher during this period than the corresponding average rate for 2008.

TABLE 9.3.19.1-1 ROI Employment in the Proposed Pisgah SEZ

Location	1999	2008	Average Annual Growth Rate, 1999–2008 (%)
San Bernardino County	712,624	806,434	1.2
California	15,566,900	17,059,574	0.9

Sources: U.S Department of Labor (2009a,b).

TABLE 9.3.19.1-2 ROI Employment in the Proposed Pisgah SEZ by Sector, 2006[a]

Industry	San Bernardino County	% of Total
Agriculture[a]	5,143	0.9
Mining	846	0.1
Construction	45,700	7.7
Manufacturing	67,306	11.4
Transportation and public utilities	49,871	8.5
Wholesale and retail trade	124,321	21.1
Finance, insurance, and real estate	28,760	4.9
Services	267,674	45.4
Other	46	0.0
Total	589,803	

[a] Agricultural employment includes 2007 data for hired farmworkers.

Sources: U.S. Bureau of the Census (2009a); USDA (2009).

TABLE 9.3.19.1-3 ROI Unemployment Rates for the Proposed Pisgah SEZ (%)

Location	1999–2008	2008	2009[a]
San Bernardino County	5.6	8.0	13.1
California	5.8	7.2	11.6

[a] Rates for 2009 are the average for January through November.

Sources: U.S. Department of Labor (2009a–c).

9.3.19.1.3 ROI Urban Population

The population of San Bernardino County in 2008 was 80% urban, with the majority of urban areas located in the western portion of the county. The largest of these, San Bernardino, had an estimated 2008 population of 198,014; other large cities in the western portion of the county include Fontana (186,869), Ontario (170,947), Rancho Cucamonga (170,057), and Victorville (109,313) (Table 9.3.19.1-4). In addition, there are eight cities in the county with a 2008 population of between 50,000 and 99,999 persons. All these cities are part of the larger urban region that includes Los Angeles, Riverside, and San Bernardino, and most are more than 70 mi (113 km) from the site of the proposed SEZ.

TABLE 9.3.19.1-4 ROI Urban Population and Income for the Proposed Pisgah SEZ

	Population			Median Household Income ($ 2008)		
City	2000	2008	Average Annual Growth Rate, 2000–2008 (%)	1999	2006–2008	Average Annual Growth Rate, 1999 and 2006–2008 (%)[a]
San Bernardino	185,401	198,014	0.8	40,093	40,764	0.2
Fontana	128,929	186,869	4.7	58,945	62,914	0.7
Ontario	158,007	170,947	1.0	54,658	57,184	0.5
Rancho Cucamonga	127,743	170,057	3.6	78,450	79,455	0.1
Victorville	64,029	109,313	6.9	46,591	52,507	1.3
Rialto	91,873	98,376	0.9	53,115	50,000	–0.7
Hesperia	62,582	85,236	3.9	51,759	48,160	–0.8
Chino	67,168	82,435	2.6	71,330	72,373	0.2
Chino Hills	66,787	73,527	1.2	100,908	103,706	0.3
Upland	68,393	71,760	0.6	62,746	67,803	0.9
Redlands	63,591	69,394	1.1	62,000	65,539	0.6
Highland	44,605	50,870	1.7	53,084	60,963	1.5
Colton	47,662	50,333	0.7	46,063	46,411	0.1
Montclair	33,049	36,231	1.2	52,527	58,094	1.1
Twentynine Palms	28,854	33,354	1.8	40,142	43,447	0.9
Adelanto	18,130	28,330	5.7	40,678	41,875	0.3
Barstow	21,119	24,392	1.8	45,152	48,042	0.7
Loma Linda	18,681	21,515	1.8	49,188	55,091	1.3
Yucca Valley	16,865	20,290	2.3	39,166	45,298	1.6
Grand Terrace	11,626	12,160	0.6	69,074	NA	NA
Big Bear Lake	5,438	6,102	1.5	44,351	NA	NA
Needles	4,830	5,293	1.2	33,614	NA	NA

[a] Data are averages for the period 2006–2008.

Source: U.S. Bureau of the Census (2009b-d).

Population growth rates among the larger cities in the county have varied over the period of 2000 to 2008. Victorville grew at an annual rate of 6.9% during this period, with higher than average growth also experienced in Fontana (4.7%), Hesperia (3.9%), and Rancho Cucamonga (3.6%). The cities of Rialto (0.9%), San Bernardino (0.8%), Colton (0.7%), and Upland (0.6%), all experienced growth rates of less than 1% between 2000 and 2008.

Elsewhere in the county, to the east of the San Bernardino area, within 40 mi (64 km) of the site of the proposed SEZ, there are a number of smaller cities. Twentynine Palms (2008 population of 33,354) and Yucca Valley (20,290) are located on the perimeter of the Twentynine Palms Marine Corps base and the Joshua Tree National Monument, and are primarily retail centers, while Barstow (24,392) is a rail and road transportation and retail center.

Population growth in these cities between 2000 and 2008 has been low, with annual growth rates of 2.3% in Yucca Valley and 1.8% in Twentynine Palms. The smallest city in the county, Needles (5,293), is located on the Colorado River, more than 100 mi (161 km) from the proposed SEZ location, and also had a relatively low population growth rate (1.2%) between 2000 and 2008.

9.3.19.1.4 ROI Urban Income

Median household incomes varied considerably across cities in the county. A number of cities in western San Bernardino County, Chino Hills ($103,706), Rancho Cucamonga ($79,455), Chino ($72,373), Upland ($67,803) Redlands ($65,539), and Fontana ($62,914) had median incomes in 2006 to 2008 that were higher than the average for the state ($61,154) (Table 9.3.19.1-4). A number of cities in the western portion of the county had relatively low median household incomes, notably San Bernardino ($40,764), Adelanto ($41,875), Colton ($46,411), and Hesperia ($48,160).

Among the cities in the western part of the county, median income growth rates between 1999 and 2006 to 2008 were highest in Highland (1.5%), Victorville (1.3%), Loma Linda (1.3%), and Montclair (1.1%), with annual growth rates of less than 1% elsewhere. Hesperia (−0.8%) and Rialto (−0.7%) had negative growth rates between 1999 and 2006 to 2008. The average median household income growth rate for the state as a whole over this period was less than 0.1%.

Elsewhere in the county, Barstow ($48,042) and Yucca Valley ($45,298) both had median household incomes less than the state average between 2006 and 2008. Median income in Needles in 2000 was $33,614. Growth rates in these cities over the period 1999 and 2006 to 2008 varied from 1.6% in Yucca Valley to 0.9% in Twentynine Palms.

9.3.19.1.5 ROI Population

Table 9.3.19.1-5 presents recent and projected populations in San Bernardino County and in the state as a whole. Population in the county stood at 2,004,914 in 2008, having grown at an average annual rate of 2.0% since 2000. Population growth in the county was higher than that for California (1.5%) over the same period. The county population is expected to increase to 2,619,128 by 2021 and to 2,694,641 by 2023.

9.3.19.1.6 ROI Income

Personal income in San Bernardino County stood at $58.1 billion in 2007 and has grown at an annual average rate of 2.8% over the period 1998 to 2007 (Table 9.3.19.1-6). Personal income per capita in the county also rose over the same period at a rate of 0.8%, increasing from $26,797 to $29,132. The personal income growth rate in the county was higher than the state rate (2.5%), but per capita income growth rate was slightly lower in the county than in California as a whole (1.1%).

TABLE 9.3.19.1-5 ROI Population for the Proposed Pisgah SEZ

Location	2000	2008	Average Annual Growth Rate, 2000–2008 (%)	2021	2023
San Bernardino County	1,721,942	2,004,914	2.0	2,619,128	2,694,641
California	33,871,648	38,129,628	1.5	44,646,420	45,667,413

Sources: U.S. Bureau of the Census (2009e-f); California Department of Finance (2010).

TABLE 9.3.19.1-6 ROI Personal Income for the Proposed Pisgah SEZ

Location	1998	2007	Average Annual Growth Rate, 1998–2007 (%)
San Bernardino County			
Total income[a]	44.1	58.1	2.8
Per capita income	26,797	29,132	0.8
California			
Total income[a]	1,231.7	1,573.6	2.5
Per capita income	37,339	41,821	1.1

[a] Unless indicated otherwise, values are reported in $ billion 2008.

Sources: U.S. Department of Commerce (2009); U.S. Bureau of Census (2009e-f).

Median household income in San Bernardino County stood at $56,575 (U.S. Bureau of the Census 2009d).

9.3.19.1.7 ROI Housing

In 2007, more than 679,169 housing units were located in San Bernardino County (Table 9.3.19.1-7). Owner-occupied units compose approximately 65% of the occupied units in the count, with rental housing making up 35% of the total. The vacancy rate in 2007 was 13.3%, and 5.3% of housing units were used for seasonal or recreational purposes. There were 90,111

TABLE 9.3.19.1-7 ROI Housing Characteristics for the Proposed Pisgah SEZ

Parameter	2000	2007[a]
San Bernardino County		
Owner-occupied	340,933	381,697
Rental	187,661	207,361
Vacant units	72,775	90,111
Seasonal and recreational use	31,657	NA
Total units	601,369	679,169

[a] 2007 data for number of owner-occupied, rental, and vacant units for Colorado counties are not available; data are based on 2007 total housing units and 2000 data on housing tenure.

[b] NA = data not available.

Sources: U.S. Bureau of the Census (2009h-j).

vacant housing units in the county in 2007, of which 31,721 are estimated to be rental units that would be available to construction workers. There were 31,657 units in seasonal, recreational, or occasional use at the time of the 2000 Census.

Housing stock in San Bernardino County grew at an annual rate of 1.8% over the period 2000 to 2007, with 77,800 new units added to the existing housing stock in the county (Table 9.3.19.1-7).

The median value of owner-occupied housing in San Bernardino County in 2008 was $366,600 (U.S. Bureau of the Census 2009g).

9.3.19.1.8 ROI Local Government Organizations

The various local and county government organizations in San Bernardino County are listed in Table 9.3.19.1-8. In addition, there are three tribal governments located in the county; members of other tribal groups are located in the state, but their tribal governments are located in adjacent states.

9.3.19.1.9 ROI Community and Social Services

This section describes educational, health care, law enforcement, and firefighting resources in the ROI.

TABLE 9.3.19.1-8 ROI Local Government Organizations and Social Institutions Associated with the Proposed Pisgah SEZ

Governments	
City	
City of Adelanto	City of Montclair
Town of Apple Valley	City of Needles
City of Barstow	City of Ontario
City of Big Bear Lake	City of Rancho Cucamonga
City of Chino	City of Redlands
City of Chino Hills	City of Rialto
City of Colton	City of San Bernardino
City of Fontana	City of Twentynine Palms
City of Grand Terrace	City of Upland
City of Hesperia	City of Victorville
City of Highland	Town of Yucca Valley
City of Loma Linda	
County	
San Bernardino County	
Tribal	
Chemehuevi Indian Tribe of the Chemehuevi Reservation, California	
San Manuel Band of Serrano Mission Indians of the San Manuel Reservation, California	
Twentynine Palms Band of Mission Indians of California	

Sources: U.S. Bureau of the Census (2009b); U.S. Department of Interior (2010).

Schools

In 2007, the single-county ROI had a total of 542 public and private elementary, middle, and high schools (NCES 2009). Table 9.3.19.1-9 provides summary statistics for enrollment and educational staffing and two indices of educational quality—student-teacher ratios and levels of service (number of teachers per 1,000 population). The student-teacher ratio in San Bernardino County was 24.3, while the level of service was 8.8.

TABLE 9.3.19.1-9 ROI School District Data for the Proposed Pisgah SEZ, 2007

Location	Number of Students	Number of Teachers	Student-Teacher Ratio	Level of Service[a]
San Bernardino County	427,603	17,568	24.3	8.8

[a] Number of teachers per 1,000 population.

Source: NCES (2009).

Health Care

There were 4,176 physicians in San Bernardino County in 2007, and the number of doctors per 1,000 population was 2.1 (Table 9.3.19.1-10).

Public Safety

Several state, county, and local police departments provide law enforcement in the ROI (Table 9.3.19.1-11). San Bernardino County has 1,783 officers and would provide law enforcement services to the SEZ. Currently, there are 1,293 professional firefighters in the county (Table 9.3.19.1-11). Levels of service are 0.9 per 1,000 population for police protection and 0.6 for fire services.

TABLE 9.3.19.1-10 Physicians in the Proposed Pisgah SEZ ROI, 2007

Location	Number of Primary Care Physicians	Level of Service[a]
San Bernardino County	4,176	2.1

[a] Number of physicians per 1,000 population.

Source: AMA (2009).

TABLE 9.3.19.1-11 Public Safety Employment in the Proposed Pisgah SEZ ROI

Location	Number of Police Officers[a]	Level of Service[b]	Number of Firefighters[c]	Level of Service
San Bernardino County	1,783	0.9	1,293	0.6

[a] 2007 data.

[b] Number per 1,000 population.

[c] 2008 data; number does not include volunteers.

Sources: U.S. Department of Justice (2008b); Fire Departments Network (2009).

9.3.19.1.10 ROI Social Structure Change

Community social structures and other forms of social organization within the ROI are related to various factors, including historical development, major economic activities and sources of employment, income levels, race and ethnicity, and forms of local political organization. Although an analysis of the character of community social structures is beyond the scope of the current programmatic analysis, project-level NEPA analyses would include a description of ROI social structures, contributing factors, their uniqueness, and consequently, the susceptibility of local communities to various forms of social disruption and social change.

Various energy development studies have suggested that once the annual growth in population is between 5 and 15% in smaller rural communities, alcoholism, depression, suicide, social conflict, divorce, and delinquency will increase, and levels of community satisfaction will decrease (BLM 1980, 1983, 1996). Tables 9.3.19.1-12 and 9.3.19.1-13 present data for a number of indicators of social change, including violent crime and property crime rates, alcoholism and illicit drug use, and mental health and divorce, that might be used to indicate social change.

Violent crime in San Bernardino County in 2007 stood at 4.6 per 1,000 population (Table 9.3.19.1-12), while the property-related crime rate was 29.6, producing an overall crime rate of 34.2.

Other measures of social change—alcoholism, illicit drug use, and mental health—are not available at the county level, and thus are presented for the SAMHSA region in which the ROI is located (Table 9.3.19.1-13).

TABLE 9.3.19.1-12 County and ROI Crime Rates in the Proposed Pisgah SEZ ROI[a]

	Violent Crime[b]		Property Crime[c]		All Crime	
	Offenses	Rate	Offenses	Rate	Offenses	Rate
San Bernardino County	9,657	4.6	61,713	29.6	71,370	34.2
California	185,173	7.8	1,080,747	45.6	1,265,920	53.4

[a] Rates are the number of crimes per 1,000 population.

[b] Violent crime includes murder and non-negligent manslaughter, forcible rape, robbery, and aggravated assault.

[c] Property crime includes burglary, larceny, theft, motor vehicle theft, and arson.

Sources: U.S. Department of Justice (2009a,b).

TABLE 9.3.19.1-13 Alcoholism, Drug Use, Mental Health, and Divorce in the Proposed Pisgah SEZ ROI[a]

Geographic Area	Alcoholism	Illicit Drug Use	Mental Health[b]	Divorce[c]
California Region 12 (includes San Bernardino County)	7.1	2.6	8.8	–[d]
California	8.1	3.1	8.5	4.3

[a] Data for alcoholism and drug use represent % of the population over 12 years of age with dependence on or abuse of alcohol, illicit drugs. Data are averages for 2004 to 2006.

[b] Data for mental health represent % of the population over 18 years of age suffering from serious psychological distress. Data are averages for 2002 to 2004.

[c] Divorce rates are the number of divorces per 1,000 population. Data are for 1990.

[d] A dash indicates data not available.

Sources: SAMHSA (2009); CDC (2009).

9.3.19.1.11 ROI Recreation

Various areas in the vicinity of the proposed SEZ are used for recreational purposes, with natural, ecological, and cultural resources in the ROI attracting visitors for a range of activities, including hunting, fishing, boating, canoeing, wildlife watching, camping, hiking, horseback riding, mountain climbing, and sightseeing. These areas are discussed in Section 9.3.5.

Because the number of visitors using state and federal lands for recreational activities is not available from the various administering agencies, the value of recreational resources in these areas, based solely on the number of recorded visitors, is likely to be an underestimation. In addition to visitation rates, the economic valuation of certain natural resources can also be assessed in terms of the potential recreational destination for current and future users, that is, their nonmarket value (see Section 5.17.1.1.1).

Another method is to estimate the economic impact of the various recreational activities supported by natural resources on public land in the vicinity of the proposed solar development, by identifying sectors in the economy in which expenditures on recreational activities occur. Not all activities in these sectors are directly related to recreation on state and federal lands, with some activity occurring on private land (e.g., dude ranches, golf courses, bowling alleys, and movie theaters). Expenditures associated with recreational activities form an important part of the economy of the ROI. In 2007, 66,139 people were employed in San Bernardino County in the various sectors identified as recreation, constituting 8.0% of total ROI employment (Table 9.3.19.1-14). Recreation spending also produced almost $1,503 million in income in the ROI in 2007. The primary sources of recreation-related employment were eating and drinking places.

TABLE 9.3.19.1-14 ROI Recreation Sector Activity for the Proposed Pisgah SEZ, 2007

Activity	Employment[b]	Income ($ million)
Amusement and recreation services	1,934	48.6
Automotive rental	1,554	85.4
Eating and drinking places	50,763	941.6
Hotels and lodging places	2,769	75.5
Museums and historic sites	134	5.5
Recreational vehicle parks and campsites	787	22.8
Scenic tours	4,469	246.5
Sporting goods retailers	3,729	77.4
Total ROI	66,139	1,503

Source: MIG, Inc. (2009).

9.3.19.2 Impacts

The following analysis begins with a description of the common impacts of solar development, including common impacts on recreation and on social change. These impacts would occur regardless of the solar technology developed in the SEZ. The impacts of developments employing various solar energy technologies are analyzed in detail in subsequent sections.

9.3.19.2.1 Common Impacts

Construction and operation of a solar energy facility at the proposed Pisgah SEZ would produce direct and indirect economic impacts. Direct impacts would occur as a result of expenditures on wages and salaries, procurement of goods and services required for project construction and operation, and the collection of state sales and income taxes. Indirect impacts would occur as project wages and salaries, procurement expenditures, and tax revenues subsequently circulate through the economy of each state, thereby creating additional employment, income, and tax revenues. Facility construction and operation would also require in-migration of workers and their families into the ROI surrounding the site, which would affect population, rental housing, health service employment, and public safety employment. Socioeconomic impacts common to all utility-scale solar energy developments are discussed in detail in Section 5.17. These impacts will be minimized through the implementation of programmatic design features described in Appendix A, Section A.2.2.

Recreation Impacts

Estimating the impact of solar facilities on recreation is problematic because it is not clear how solar development in the SEZ would affect recreational visitation and the value of recreational resources for potential or future visits (See Section 5.17.1.2.3). While it is clear that some land in the ROI would no longer be accessible for recreation, the majority of popular recreational locations would be precluded from solar development. It is also possible that solar facilities in the ROI would be visible from popular recreation locations, and that construction workers residing temporarily in the ROI would occupy accommodation otherwise used for recreational visits, thus reducing visitation and consequently affecting the economy of the ROI.

Social Change

Although an extensive literature in sociology documents the most significant components of social change in energy boomtowns, the nature and magnitude of the social impact of energy developments in small rural communities are still unclear (see Section 5.17.1.1.4). While some degree of social disruption is likely to accompany large-scale in-migration during the boom phase, there is insufficient evidence to predict the extent to which specific communities are likely to be affected, which population groups within each community are likely to be most affected, and the extent to which social disruption is likely to persist beyond the end of the boom period (Smith et al. 2001). Accordingly, because of the lack of adequate social baseline data, it has been suggested that social disruption is likely to occur once an arbitrary population growth rate associated with solar energy development projects has been reached, with an annual rate of between 5 and 10% growth in population assumed to result in a breakdown in social structures, with a consequent increase in alcoholism, depression, suicide, social conflict, divorce, delinquency, and deterioration in levels of community satisfaction (BLM 1980, 1983, 1996).

In overall terms, the in-migration of workers and their families into the ROI would represent an increase of less than 0.1% in county population during construction of the trough technology, with smaller increases for the power tower, dish engine, and PV technologies, and during the operation of each technology. While it is possible that some construction and operations workers will choose to locate in communities closer to the SEZ, the insufficient range of housing choices to suit all solar occupations and lack of available housing in smaller rural communities in the ROI to accommodate all in-migrating workers and families, make it likely that many workers will commute to the SEZ from larger communities elsewhere in the ROI, thereby reducing the potential impact of solar development on social change. Regardless of the pace of population growth associated with the commercial development of solar resources, and the likely residential location of in-migrating workers and families in communities some distance from the SEZ itself, the number of new residents from outside the ROI is likely to lead to some demographic and social change in small rural communities in the ROI. Communities hosting solar development are likely to be required to adapt to a different quality of life, with a transition away from a more traditional lifestyle involving ranching and taking place in small, isolated, close-knit, homogenous communities with a strong orientation toward personal and family relationships, toward a more urban lifestyle, with increasing cultural and ethnic diversity, and increasing dependence on formal social relationships within the community.

9.3.19.2.2 Technology-Specific Impacts

The economic impacts of solar energy development in the proposed SEZ were measured in terms of employment, income, state tax revenues (sales and income), population in-migration, housing, and community service employment (education, health, and public safety). More information on the data and methods used in the analysis are provided in Appendix M.

The assessment of the impact of the construction and operation of each technology was based on SEZ acreage, assuming 80% of the area could be developed. To capture a range of possible impacts, solar facility size was estimated on the basis of the land requirements of various solar technologies, assuming that 9 acres/MW (0.04 km^2/MW) would be required for power tower, dish engine, and PV technologies, and 5 acres/MW (0.02 km^2/MW) for solar trough technologies. Impacts of multiple facilities employing a given technology at each SEZ were assumed to be the same as impacts for a single facility with the same total capacity. Construction impacts were assessed for a representative peak year of construction, assumed to be 2021 for each technology. Construction impacts assumed that a maximum of two projects could be constructed within a given year, with a corresponding maximum land disturbance of up to 6,000 acres (12 km^2). For operations impacts, a representative first year of operations was assumed to be 2023 for each technology. The years of construction and operations were selected as representative of the entire 20-year study period because they are the approximate midpoint; construction and operations could begin earlier.

Solar Trough

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of solar trough technologies would be up to 10,667 jobs (Table 9.3.19.2-2). Construction activities would constitute 1.1% of total ROI employment. A solar development would also produce $870.6 million in income. Direct sales taxes would be $27.5 million, with direct income taxes of $12.6 million.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 1,486 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodation (hotels, motels, and mobile home parks) would mean that the impact of solar facility construction on the number of vacant rental housing units is not expected to be large, with 743 rental units expected to be occupied in the ROI. This occupancy rate would represent 1.8% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would also affect community service employment (education, health, and public safety). An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, 14 new teachers, 3 physicians, and 2 public safety employees (career firefighters and uniformed police officers) would be required in the ROI. These increases would represent 0.1% of total ROI employment expected in these occupations.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using solar trough technologies would be 1,385 jobs (Table 9.3.19.2-2). Such a solar facility would also produce $60.6 million in income. Direct sales taxes would be $0.4 million, with direct income taxes of $1.3 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010a), acreage rental payments would be $3.0 million, and solar generating capacity payments would total at least $25.2 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 106 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodation (hotels, motels, and mobile home parks) would mean that the impact of solar facility operation on the number of vacant owner-occupied housing units is not expected to be large, with 96 owner-occupied units expected to be occupied in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (health, education, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the provision of these services in the ROI. Accordingly, one new teacher would be required in the ROI.

Power Tower

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of power tower technologies would be up to 4,249 jobs (Table 9.3.19.2-3). Construction activities would constitute 0.4% of total ROI employment. Such a solar facility would also produce $346.7 million in income. Direct sales taxes would be $10.9 million, with direct income taxes of $5.0 million.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 592 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodation (hotels, motels, and mobile home parks) would mean that the impact of solar facility construction on the number of vacant rental housing units is not expected to be large, with 296 rental units expected to be occupied in the ROI. This occupancy rate would represent 0.7% of the vacant rental units expected to be available in the ROI.

TABLE 9.3.19.2-2 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Pisgah SEZ with Trough Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	3,488	835
Total	10,667	1,385
Income[b]		
Total	870.6	60.6
Direct state taxes[b]		
Sales	27.5	0.4
Income	12.6	1.3
BLM payments ($ million 2008)		
Rental	NA[c]	3.0
Capacity[d]	NA	25.2
In-migrants (no.)	1,486	106
Vacant housing[e] (no.)	743	96
Local community service employment		
Teachers (no.)	14	1
Physicians (no.)	3	0
Public safety (no.)	2	0

a Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 1,200 MW (corresponding to 6,000 acres [24 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 3,832 MW.

b Unless indicated otherwise, values are reported in $ million 2008.

c NA = not applicable.

d The BLM annual capacity payment was based on a fee of $6,570 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010a), assuming a solar facility with no storage capability, and full build-out of the site. Projects with three or more hours of storage would generate higher payments, based on a fee of $7,884 per MW.

e Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

TABLE 9.3.19.2-3 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Pisgah SEZ with Power Tower Facilities[a]

Parameter	Construction	Operations
Employment (no.)		
Direct	1,389	431
Total	4,249	601
Income[b]		
Total	346.7	24.6
Direct state taxes[b]		
Sales	10.9	<0.1
Income	5.0	0.7
BLM payments ($ million 2008)		
Rental	NA[c]	3.0
Capacity[d]	NA	14.0
In-migrants (no.)	592	55
Vacant housing[e] (no.)	296	49
Local community service employment		
Teachers (no.)	6	1
Physicians (no.)	1	0
Public safety (no.)	1	0

[a] Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 667 MW (corresponding to 6,000 acres [24 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 2,129 MW.

[b] Unless indicated otherwise, values are reported in $ million 2008.

[c] NA = not applicable.

[d] The BLM annual capacity payment was based on a fee of $6,570 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010a), assuming a solar facility with no storage capability, and full build-out of the site. Projects with three or more hours of storage would generate higher payments, based on a fee of $7,884 per MW.

[e] Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, six new teachers, one physician, and one public safety employee would be required in the ROI. These increases would represent less than 0.1% of total ROI employment expected in these occupations.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using power tower technologies would be 601 jobs (Table 9.3.19.2-3). Such a solar development would also produce $24.6 million in income. Direct sales taxes would be less than $0.1 million, with direct income taxes of $0.7 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010a), acreage rental payments would be $3.0 million, and solar generating capacity payments would total at least $14.0 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 55 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodation (hotels, motels and mobile home parks) would mean that the impact of solar facility operation on the number of vacant owner-occupied housing units is not expected to be large, with 49 owner-occupied units expected to be required in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, one new teacher would be required in the ROI.

Dish Engine

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of dish engine technologies would be up to 1,727 jobs (Table 9.3.19.2-4). Construction activities would constitute 0.1% of total ROI employment. Such a solar facility would also produce $141.0 million in income. Direct sales taxes would be $4.5 million, with direct income taxes of $2.0 million.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 241 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodation (hotels, motels, and mobile home parks) would mean that the impact of solar facility construction on the number of vacant rental housing units is not expected to be large,

TABLE 9.3.19.2-4 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Pisgah SEZ with Dish Engine Facilities[a]

Parameter	Construction	Operations
Employment (no.)		
Direct	565	419
Total	1,727	584
Income[b]		
Total	141.0	23.9
Direct state taxes[b]		
Sales	4.5	<0.1
Income	2.0	0.7
BLM payments ($ million 2008)		
Rental	NA[c]	3.0
Capacity[d]	NA	14.0
In-migrants (no.)	241	53
Vacant housing[e](no.)	120	48
Local community service employment		
Teachers (no.)	2	1
Physicians (no.)	0	0
Public safety (no.)	0	0

a Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 667 MW (corresponding to 6,000 acres [24 km^2] of land disturbance) could be built. Operations impacts were based on total development of the site, producing a total output of 2,129 MW.

b Unless indicated otherwise, values are reported in $ million 2008.

c NA = not applicable.

d The BLM annual capacity payment was based on a fee of $6,570 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010a), assuming a solar facility with no storage capability, and full build-out of the site. Projects with three or more hours of storage would generate higher payments, based on a fee of $7,884 per MW.

e Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

with 120 rental units expected to be occupied in the ROI. This occupancy rate would represent 0.3% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, two new teachers would be required in the ROI. This increase would represent less than 0.1% of total ROI employment expected in this occupation.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using dish engine technologies would be 584 jobs (Table 9.3.19.2-4). Such a solar development would also produce $23.9 million in income. Direct sales taxes would be less than $0.1 million, with direct income taxes of $0.7 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010a), acreage rental payments would be $3.0 million, and solar generating capacity payments would total at least $14.0 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a dish engine solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 53 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodation (hotels, motels, and mobile home parks) would mean that the impact of solar facility operation on the number of vacant owner-occupied housing units is not expected to be large, with 48 owner-occupied units expected to be required in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service employment (education, health, and public safety). An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, one new teacher would be required in the ROI.

Photovoltaic

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) using PV technologies would be up to 806 jobs (Table 9.3.19.2-5). Construction activities would constitute 0.1 % of total ROI employment. Such a solar development would also produce $65.7 million in income. Direct sales taxes would be $2.1 million, with direct income taxes of $1.0 million.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 112 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary

TABLE 9.3.19.2-5 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Pisgah SEZ with PV Facilities[a]

Parameter	Construction	Operations
Employment (no.)		
Direct	263	42
Total	806	58
Income[b]		
Total	65.7	2.4
Direct state taxes[b]		
Sales	2.1	<0.1
Income	1.0	<0.1
BLM payments ($ million 2008)		
Rental	NA[c]	3.0
Capacity[d]	NA	11.2
In-migrants (no.)	112	5
Vacant housing[e] (no.)	56	5
Local community service employment		
Teachers (no.)	1	0
Physicians (no.)	0	0
Public safety (no.)	0	0

[a] Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 667 MW (corresponding to 6,000 acres [24 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 2,129 MW.

[b] Unless indicated otherwise, values are reported in $ million 2008.

[c] NA = not applicable.

d The BLM annual capacity payment was based on a fee of $5,256 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010a), assuming full build-out of the site.

[e] Construction activities would affect vacant rental housing; operations activities would affect owner-occupied housing.

accommodation (hotels, motels, and mobile home parks) would mean that the impact of solar facility construction on the number of vacant rental housing units is not expected to be large, with 56 rental units expected to be occupied in the ROI. This occupancy rate would represent 0.1% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, 1 new teacher would be required in the ROI. This increase would represent less than 0.1% of total ROI employment expected in this occupation.

***Operations*.** Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using PV technologies would be 58 jobs (Table 9.3.19.2-5). Such a solar development would also produce $2.4 million in income. Direct sales taxes would be less than $0.1 million, with direct income taxes of less than $0.1 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010a), acreage rental payments would be $3.0 million, and solar generating capacity payments would total at least $11.2 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a solar facility would mean that some in-migration of workers and their families from outside the ROI would be required, with 5 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodation (hotels, motels, and mobile home parks) would mean that the impact of solar facility operation on the number of vacant owner-occupied housing units is not expected to be large, with 5 owner-occupied units expected to be required in the ROI.

No new community service employment would be required to meet existing levels of service in the ROI.

9.3.19.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features addressing socioeconomic impacts have been identified for the proposed Pisgah SEZ. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would reduce the potential for socioeconomic impacts during all project phases.

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9.3.20 Environmental Justice

9.3.20.1 Affected Environment

E.O. 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" (*Federal Register*, Vol. 59, page 7629, Feb. 11, 1994), formally requires federal agencies to incorporate environmental justice as part of their missions. Specifically, it directs them to address, as appropriate, any disproportionately high and adverse human health or environmental effects of their actions, programs, or policies on minority and low-income populations.

The analysis of the impacts of solar energy projects on environmental justice issues follows guidelines described in the CEQ's *Environmental Justice Guidance under the National Environmental Policy Act* (CEQ 1997). The analysis method has three parts: (1) a description of the geographic distribution of low-income and minority populations in the affected area is undertaken; (2) an assessment is conducted to determine whether the impacts of construction and operation would produce impacts that are high and adverse; and (3) if impacts are high and adverse, a determination is made as to whether these impacts disproportionately affect minority and low-income populations.

Construction and operation of solar energy projects in the proposed SEZ could affect environmental justice if any adverse health and environmental impacts resulting from either phase of development are significantly high, and if these impacts would disproportionately affect minority and low-income populations. If the analysis determines that health and environmental impacts are not significant, there can be no disproportionate impacts on minority and low-income populations. In the event impacts are significant, disproportionality would be determined by comparing the proximity of any high and adverse impacts with the location of low-income and minority populations.

The analysis of environmental justice issues associated with the development of solar facilities considered impacts within the SEZ and an associated 50-mi (80-km) radius around the boundary of the SEZ. A description of the geographic distribution of minority and low-income groups in the affected area was based on demographic data from the 2000 Census (U.S. Bureau of the Census 2009k,l). The following definitions were used to define minority and low-income population groups:

- **Minority**. Persons are included in the minority category if they identify themselves as belonging to any of the following racial groups: (1) Hispanic, (2) Black (not of Hispanic origin) or African American, (3) American Indian or Alaska Native, (4) Asian, or (5) Native Hawaiian or Other Pacific Islander.

  Beginning with the 2000 Census, where appropriate, the census form allows individuals to designate multiple population group categories to reflect their ethnic or racial origin. In addition, persons who classify themselves as being of multiple racial origins may choose up to six racial groups as the basis of

their racial origins. The term minority includes all persons, including those classifying themselves in multiple racial categories, except those who classify themselves as not of Hispanic origin and as White or "Other Race" (U.S. Bureau of the Census 2009k).

The CEQ guidance proposed that minority populations should be identified where either (1) the minority population of the affected area exceeds 50%, or (2) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis.

The PEIS applies both criteria in using the Census Bureau data for census block groups, wherein consideration is given to the minority population that is both greater than 50% and 20 percentage points higher than in the state (the reference geographic unit).

- **Low-Income**. Individuals who fall below the poverty line. The poverty line takes into account family size and age of individuals in the family. In 1999, for example, the poverty line for a family of five with three children below the age of 18 was $19,882. For any given family below the poverty line, all family members are considered as being below the poverty line for the purposes of analysis (U.S. Bureau of the Census 2009l).

The data in Table 9.3.20.1-1 show the minority and low-income composition of total population located in the proposed SEZ based on 2000 Census data and CEQ Guidelines. Individuals identifying themselves as Hispanic or Latino are included in the table as a separate entry. However, because Hispanics can be of any race, this number also includes individuals identifying themselves as being part of one or more of the population groups listed in the table.

A large number of minority and low-income individuals are located in the 50-mi (80-km) area around the boundary of the SEZ. Within the 50-mi (80-km) radius, 37.8% of the population is classified as minority, while 16.7% is classified as low-income. However, the number of minority individuals does not exceed 50% of the total population in the area, and the number of minority individuals does not exceed the state average by 20 percentage points or more, meaning that there is no minority population in the SEZ area based on 2000 Census data and CEQ guidelines. The number of low-income individuals does not exceed the state average by 20 percentage points or more, and does not exceed 50% of the total population in the area, meaning that there are no low-income populations in the SEZ.

Figures 9.3.20.1-1 and 9.3.20.1-2 show the locations of the minority and low-income population groups within the 50-mi (80-km) radius around the boundary of the SEZ.

Within the 50-mi (80-km) radius around the SEZ, more than 50% of the population is classified as minority in block groups located in the City of Barstow and to the northwest of the city, in the city of San Bernardino and vicinity, to the northeast of the SEZ, and to the south of the SEZ associated with the Morongo Indian Reservation. Block groups with minority

TABLE 9.3.20.1-1 Minority and Low-Income Populations within the 50-mi (80-km) Radius Surrounding the Proposed Pisgah SEZ

Parameter	California
Total population	354,336
White, non-Hispanic	220,502
Hispanic or Latino	85,617
Non-Hispanic or Latino minorities	48,217
One race	37,623
Black or African American	25,136
American Indian or Alaskan Native	3,422
Asian	7,276
Native Hawaiian or Other Pacific Islander	1,116
Some other race	673
Two or more races	10,594
Total minority	133,834
Low-income	56,533
Percent minority	37.8
State percent minority	40.5
Percent low-income	16.7
State percent low-income	14.2

Source: U.S Bureau of the Census (2009k,l).

populations more than 20 percentage points higher than the state average are located in the City of Barstow and in the City of San Bernardino and vicinity.

Census block groups within the 50-mi (80-km) radius where the low-income population is more than 20 percentage points higher than the state average are located in the City of Barstow and in the City of San Bernardino, and in the vicinity of San Bernardino. Additional block groups with low-income populations are located to the southeast, and to the northwest of Barstow, and in the vicinity of Twentynine Palms. Block groups with more than 50% of the population classified as low-income are located in the Cities of Barstow and San Bernardino, and to the southeast of the SEZ, east of the Twentynine Palms military base.

9.3.20.2 Impacts

Environmental justice concerns common to all utility-scale solar energy developments are described in detail in Section 5.18. These impacts will be minimized through the

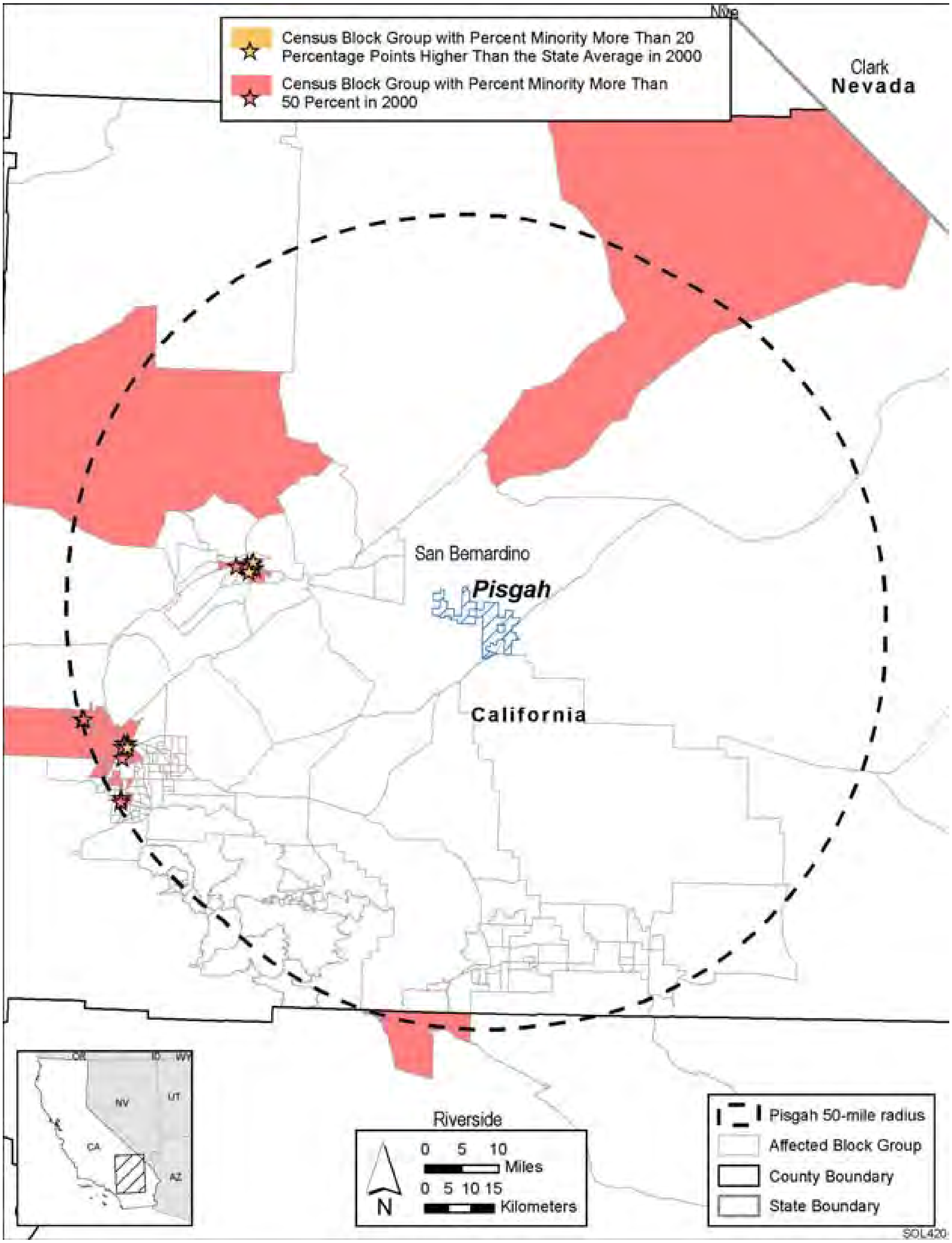

FIGURE 9.3.20.1-1 Minority Population Groups within the 50-mi (80-km) Radius Surrounding the Proposed Pisgah SEZ

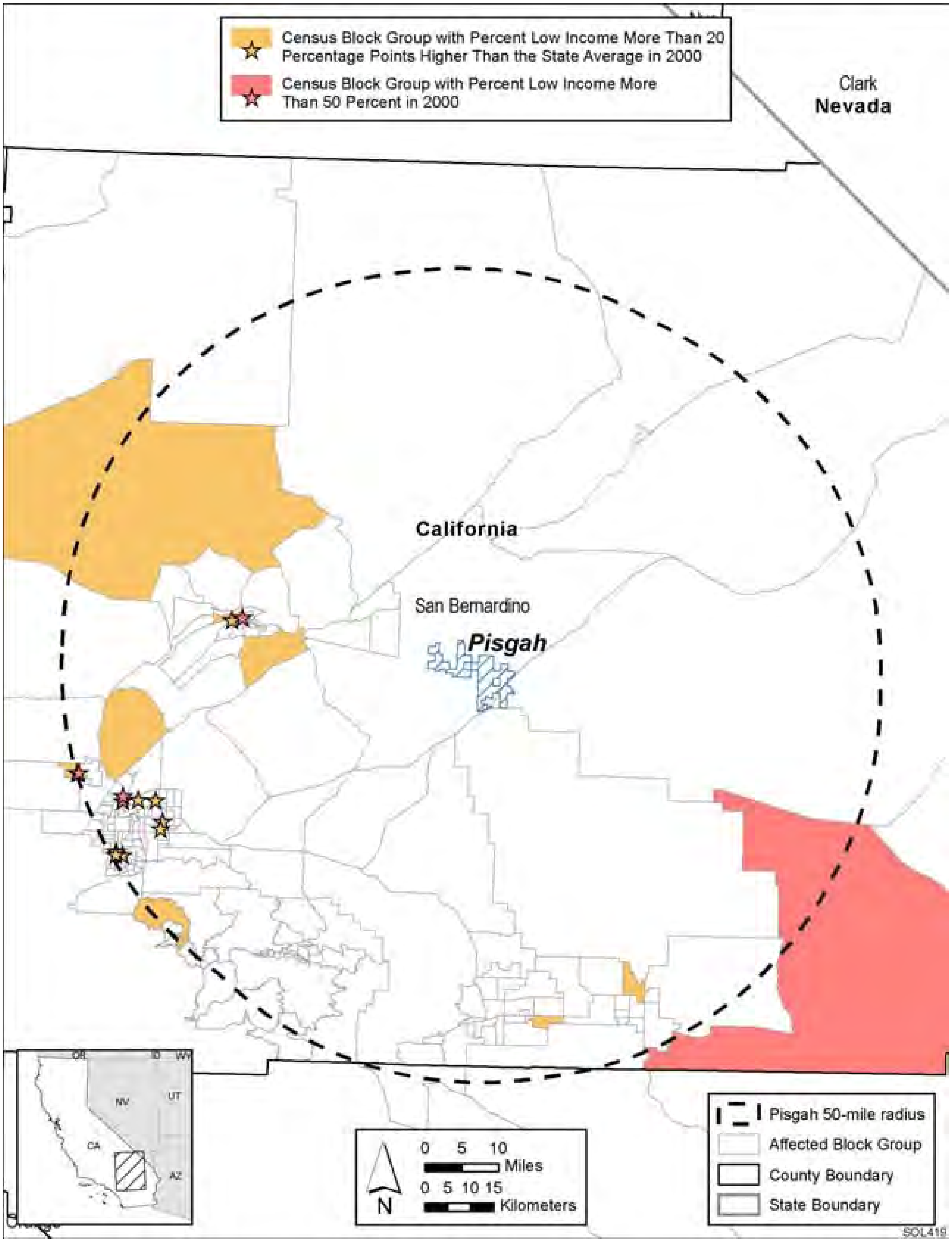

FIGURE 9.3.20.1-2 Low-Income Population Groups within the 50-mi (80-km) Radius Surrounding the Proposed Pisgah SEZ

implementation of programmatic design features described in Appendix A, Section A.2.2, which address the underlying environmental impacts contributing to the concerns. The potentially relevant environmental impacts associated with solar development within the proposed Pisgah SEZ include noise and dust during the construction of solar facilities; noise and EMF effects associated with solar project operations; the visual impacts of solar generation and auxiliary facilities, including transmission lines; access to land used for economic, cultural, or religious purposes; and effects on property values as areas of concern that might potentially affect minority and low-income populations. Minority populations have been identified within 50 mi (80 km) of the proposed Pisgah SEZ; low-income populations are also present (Section 9.3.20.1).

Potential impacts on low-income and minority populations could be incurred as a result of the construction and operation of solar facilities involving each of the four technologies. Although impacts are likely to be small, there are minority populations defined by CEQ guidelines (Section 9.3.20.1) within the 50-mi (80-km) radius around the boundary of the SEZ, meaning that any adverse impacts of solar projects could disproportionately affect minority populations. Because there are also low-income populations within the 50-mi (80-km) radius, according to CEQ guidelines, there could also be impacts on low-income populations.

9.3.20.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features addressing environmental justice impacts have been identified for the proposed Pisgah SEZ. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's Solar Energy Program, would reduce the potential for environmental justice impacts during all project phases.

9.3.21 Transportation

The proposed Pisgah SEZ is accessible by road and rail. An interstate highway and a rail line pass through the SEZ. Three small airports are located within 62 mi (100 km) of the SEZ. General transportation considerations and impacts are discussed in Sections 3.4 and 5.19, respectively.

9.3.21.1 Affected Environment

I-40 passes along the southern edge of and then through the Pisgah SEZ, as shown in Figure 9.3.21.1-1. The town of Barstow is located about 25 mi (40 km) to the west of the SEZ along I-40. I-40 terminates in Barstow where it joins I-15, which travels from the southwest to the northeast. From Barstow, the Los Angeles area is about 70 mi (113 km) to the southwest on I-15, and Las Vegas is about 155 mi (249 km) to the northeast. To the east of the SEZ, I-40 continues on through Needles, California, approximately 105 mi (169 km) away. Access to the SEZ from I-40 is available from exits at Fort Cady Road (to the west of the SEZ), Hector Road (midway through the SEZ), and Pisgah Crater Road (at the eastern end of the SEZ). The National Trails Highway (historic U.S. 66) also passes through the SEZ as it runs south of and parallel to I-40. Hector Road runs north-south through the middle of the SEZ. North of the I-40 interchange, Hector Road becomes a dirt/gravel road. A number of other local dirt roads cross the SEZ, including those that run parallel to the railroad tracks. The AADT value for I-40 at Hector Road in 2008 was 12,500 (Caltrans 2009a), with approximately 260 vehicles a day exiting onto Hector Road and about 200 vehicles a day entering I-40 from Hector Road (Caltrans 2009b). Annual average traffic volumes along I-15, I-40, and state roads near Barstow for 2008 are provided in Table 9.3.21.1-1. Figure 9.3.21-1 also shows the designated open OHV routes in the proposed Pisgah SEZ. These routes were designated under the CDCA Plan (BLM 1999).

The BNSF Railway serves the area (BNSF 2005). Local stops are in Newberry, Hector, and Pisgah (BNSF 2010). To the west of the SEZ, the BNSF railroad passes through Barstow where it splits, with one line going north to the San Francisco area and the other branch going south to the Los Angeles area. The UP Railroad is also nearby, with a connection to the BNSF Railroad between Barstow and Newberry at Daggett to the west of the proposed Pisgah SEZ. From that interchange, the UP Railroad travels to the northeast and passes through Yermo on its way Las Vegas (UPR 2009).

Three small public airports are within a driving distance of approximately 62 mi (100 km) of the Pisgah SEZ. The nearest public airport is the Barstow-Daggett Airport, which is 12 mi (19 km) to the west of the Pisgah SEZ along I-40. The airport is owned by the County of San Bernardino and has two asphalt runways that are in good condition; they are 5,123- and 6,402-ft (1,561- and 1,951-m) long (FAA 2009). The County of San Bernardino also operates the Apple Valley Airport that is located about 30 mi (48 km) south of Barstow near I-15, a driving distance of approximately 56 mi (90 km) from the Pisgah SEZ. The Apple Valley Airport has two asphalt runways in good condition; they are 4,099- and 6,498-ft (1,249- and 1,981-m) long (FAA 2009). Scheduled commercial passenger service is not available at either the Barstow-Daggett or Apple Valley Airports.

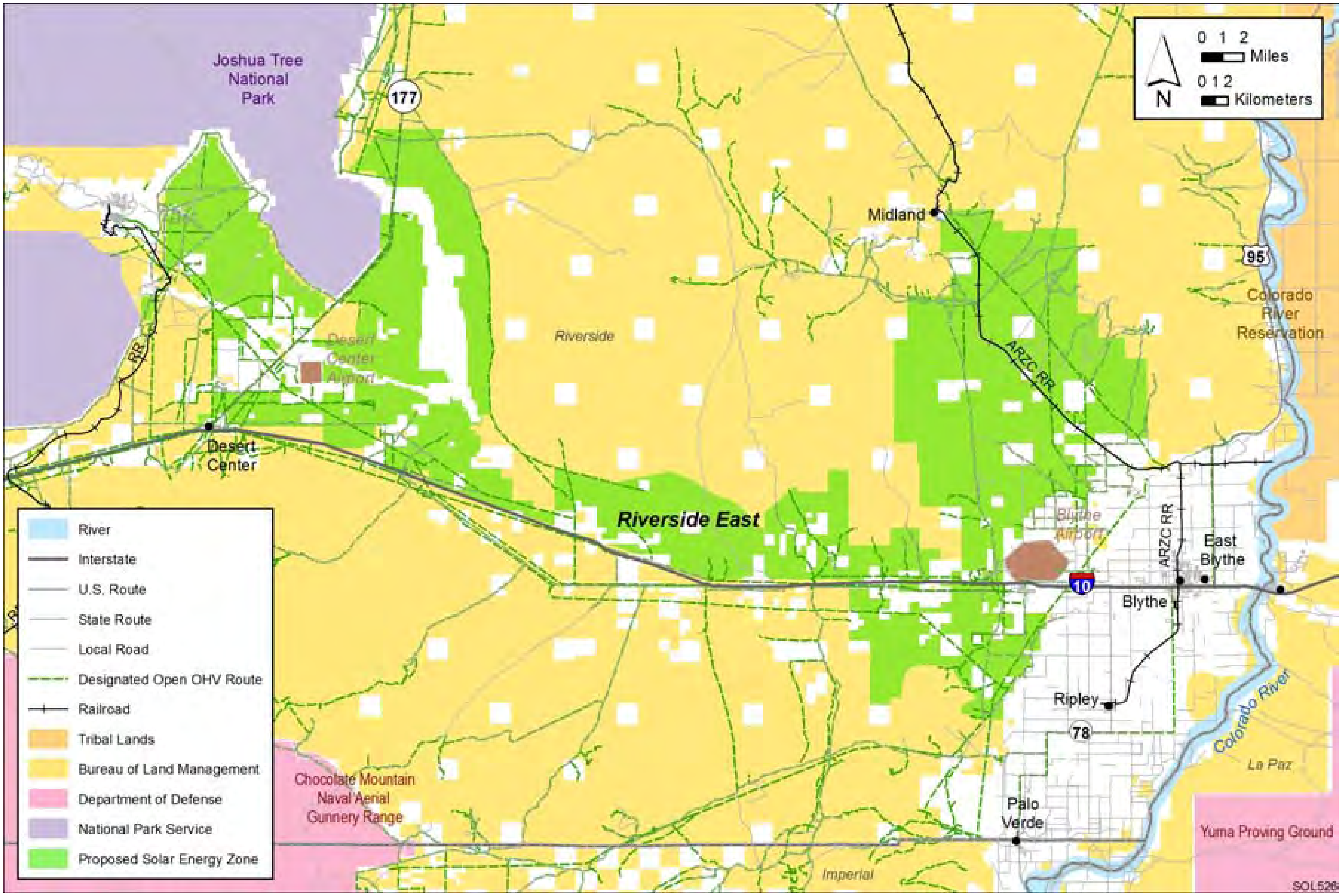

FIGURE 9.3.21.1-1 Local Transportation Network Serving the Proposed Pisgah SEZ

TABLE 9.3.21.1-1 AADT on Major Roads near the Proposed Pisgah SEZ, 2008

Road	General Direction	Location	AADT (Vehicles)
I-15	Southwest–Northeast	Southwest of junction State Route 58	57,000
		Northeast of junction State Route 58	70,000
		West of junction State Route 247	69,000
		East of junction State Route 247	64,000
		West of Yermo/Calico Road interchange	40,000
		East of Yermo/Calico Road interchange	37,500
I-40	East–West	Junction I-15	18,000
		A Street exit (Daggett)	14,000
		Newberry Road exit	12,600
		Fort Cady Road exit (west of Pisgah SEZ)	12,600
		Hector Road exit (at Pisgah SEZ)	12,500
		Crucero Road exit (east of Pisgah SEZ)	11,900
State Route 58	East–West	Junction I-15	11,500
		West of Lenwood Road	10,600
		East of Lenwood Road	11,000
State Route 247	North–South	Junction I-15	18,700
		North of Stoddard Wells Road	1,800
		South of Stoddard Wells Road	2,200

Source: Caltrans (2009a).

A third airport, the Southern California Logistics Airport, is located at the site of the former George Air Force Base in Victorville, California, approximately 62 mi (100 km) from the Pisgah SEZ. Redevelopment of the base, now leased from the U.S. Air Force, is being undertaken by the City of Victorville and a private corporation (Global Access 2010). A multimodal transportation hub with associated commercial development is envisaged, and the overall complex is named Global Access. Along with the airport and its two asphalt/concrete runways, which are 9,138- and 15,050-ft (2,785- and 4,587-m) long, Global Access includes service by two railroads (BNSF and UP) and intermodal facilities. In 2008, 10,006 passengers departed and 6,126 arrived at the airport, while 250 lb (113 kg) of freight departed and 354,715 lb (160,870 kg) arrived at the airport (BTS 2009).

9.3.21.2 Impacts

As discussed in Section 5.19, primary transportation impacts are anticipated to be from commuting worker traffic. I-40 and the National Trails Highway provide a regional traffic corridor that would experience small impacts for single projects that may have up to 1,000 daily workers, with an additional 2,000 vehicle trips per day (maximum). Such an increase is approximately 15% of the current traffic on I-40 alone, as summarized in Table 9.3.21.1-1, which provides the available AADT values for routes in the vicinity of the SEZ. However, the exits on I-40 might experience moderate impacts with some congestion. Local road improvements would be necessary in any portion of the SEZ that might be developed near the I-40 exits and along the National Trails Highway so as not to overwhelm the local roads near any site access point(s).

Solar development within the SEZ would affect public access along OHV routes designated open and available for public use. There are routes designated as open within the proposed SEZ. Such open routes crossing areas granted ROWs for solar facilities would be re-designated as closed (see Section 5.5.1 for more details on how routes coinciding with proposed solar facilities would be treated).

Should two large projects with approximately 1,000 daily workers each be under development simultaneously, an additional 4,000 vehicle trips per day (maximum) could be added to I-40 in the vicinity of the SEZ, assuming ride-sharing is not implemented. This would be about a 30% increase in the current average daily traffic level on I-40 near the SEZ and could have moderate impacts on traffic flow during peak commuter times. The extent of the problem would depend on the relative locations of the projects within the SEZ, where the worker populations originate, and the work schedules. The affected exits on I-40 would experience moderate impacts with some congestion. The National Trails Highway could also experience moderate congestion impacts dependent on the location of the solar projects in the SEZ and the percentage of commuter traffic using the highway. Local road improvements would be necessary in any portion of the SEZ near I-40 that might be developed so as not to overwhelm the local roads near any site access point(s).

9.3.21.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features have been identified related to impacts on transportation systems around the Pisgah SEZ. The programmatic design features discussed in Appendix A, Section A.2.2, including local road improvements, multiple site access locations, staggered work schedules, and ride sharing, would all provide some relief to traffic congestion on local roads leading to the site. Depending on the location of the proposed solar facility within the SEZ, more specific access locations and local road improvements would be implemented.

9.3.22 Cumulative Impacts

The analysis presented in this section addresses the potential cumulative impacts in the vicinity of the proposed Pisgah SEZ in San Bernardino County, California. The CEQ guidelines for implementing NEPA define cumulative impacts as environmental impacts resulting from the incremental impacts of an action when added to other past, present, and reasonably foreseeable future actions (40 CFR 1508.7). The impacts of other actions are considered without regard to the agency (federal or nonfederal), organization, or person that undertakes them. The time frame of this cumulative impacts assessment could appropriately include activities that would occur up to 20 years in the future (the general time frame for PEIS analyses), but little or no information is available for projects that could occur more than 5 to 10 years in the future.

The nearest population center is the small community of Newberry Springs, located near the western boundary of the SEZ. The area around the proposed Pisgah SEZ is mostly open rangeland. The BLM GeoCommunicator Database contained no records of agricultural crop production in the SEZ or adjacent to the SEZ boundary. Some irrigated agricultural land occurs about 10 mi (16 km) west of the SEZ. The southern border of the SEZ abuts the northwest corner of the U.S. Marine Corps Air Ground Combat Center. The Rodman Mountains WA and Newberry Mountains WA are located south of I-40, about 10 mi (16 km) southwest and south of the SEZ. A designated energy corridor (No. 27-41) extends through the SEZ, mostly paralleling I-40 in an east–west direction. Two grazing allotments occur in the area. The Ord Mountain allotment is located about 10 to 20 mi (16 to 32 km) southwest of the SEZ. The southwestern portion of the Cady Mountain allotment overlaps most of the Pisgah SEZ north of I-40. The geographic extent of the cumulative impacts analysis for potentially affected resources near the Pisgah SEZ is identified in Section 9.3.22.1. An overview of ongoing and reasonably foreseeable future actions is presented in Section 9.3.22.2. General trends in population growth, energy demand, water availability, and climate change are discussed in Section 9.3.22.3. Cumulative impacts for each resource area are discussed in Section 9.3.22.4.

9.3.22.1 Geographic Extent of the Cumulative Impacts Analysis

The geographic extent of the cumulative impacts analysis for potentially affected resources evaluated near the Pisgah SEZ is provided in Table 9.3.22.1-1. These geographic areas define the boundaries encompassing potentially affected resources. Their extent may vary on the basis of the nature of the resource being evaluated and the distance at which an impact may occur (thus, for example, the evaluation of air quality may have a greater regional extent of impact than that of visual values). Most of the lands around the SEZ are administered by the BLM, the NPS, or the DoD. The BLM administers approximately 42% of the lands within a 50-mi (80-km) radius of the SEZ.

TABLE 9.3.22.1-1 Geographic Extent of the Cumulative Impacts Analysis by Resource Area: Proposed Pisgah SEZ

Resource Area	Geographic Extent
Land Use	Western San Bernardino County
Specially Designated Areas and Lands with Wilderness Characteristics	Western San Bernardino County
Rangeland Resources	Western San Bernardino County
Recreation	Western San Bernardino County
Military and Civilian Aviation	Western and central San Bernardino County
Soil Resources	Areas within and adjacent to the Pisgah SEZ
Minerals	Western San Bernardino County
Water Resources	
Surface Water	Mojave River, Troy Lake, Lavic Lake, ephemeral drainages in the Mojave Valley and the Lavic Valley
Groundwater	Lavic Valley Groundwater Basin, Lower Mojave River Valley Groundwater Basin
Air Quality and Climate	A 31-mi (50-km) radius from the center of the Pisgah SEZ within the Mojave Desert Air Basin
Vegetation, Wildlife and Aquatic Biota, Special Status Species	A 50-mi (80-km) radius from the center of the Pisgah SEZ
Visual Resources	Viewshed within a 25-mi (40-km) radius of the Pisgah SEZ
Acoustic Environment (noise)	Areas adjacent to the Pisgah SEZ
Paleontological Resources	Areas within and adjacent to the Pisgah SEZ
Cultural Resources	Areas within and adjacent to the Pisgah SEZ for archaeological sites; viewshed within a 25-mi (40-km) radius of the Pisgah SEZ for other properties, such as traditional cultural properties
Native American Concerns	Areas within and adjacent to the Pisgah SEZ and viewshed within a 25-mi (40-km) radius of the proposed Pisgah SEZ
Socioeconomics	A 50-mi (80-km) radius from the center of the Pisgah SEZ
Environmental Justice	A 50-mi (80-km) radius from the center of the Pisgah SEZ
Transportation	I-15 and I-40

9.3.22.2 Overview of Ongoing and Reasonably Foreseeable Future Actions

The future actions described below are those that are "reasonably foreseeable;" that is, they have already occurred, are ongoing, are funded for future implementation, or are included in firm near-term plans. Types of proposals with firm near-term plans include:

- Proposals for which NEPA documents are in preparation or finalized;
- Proposals in a detailed design phase;
- Proposals listed in formal NOIs published in the Federal Register or state publications;
- Proposals for which enabling legislations has been passed; and
- Proposals that have been submitted to federal, state, or county regulators to begin a permitting process.

Projects in the bidding or research phase or that have been put on hold were not included in the cumulative impact analysis.

The reasonably foreseeable future actions described below are grouped into two categories: those that relate to (1) energy production and distribution, including potential solar energy projects under the proposed action (Section 9.3.22.2.1), and (2) other actions, including those related to mining and mineral processing, grazing management, transportation, recreation, water management, and conservation (Section 9.3.22.2.2. Together, these actions have the potential to affect human and environmental receptors within western San Bernardino County over the next 20 years.

9.3.22.2.1 Energy Production and Distribution

Reasonably foreseeable future actions related to energy production and distribution within 50 mi (80 km) of the center of the Pisgah SEZ are described in the following sections. That area is entirely within San Bernardino County. Future renewable energy facilities are expected to be the main contributors to potential future impacts in this area because of favorable conditions in the area for their development, large acreages required, and potentially large quantities of water used. The area is otherwise largely undeveloped and would be expected to remain so in the absence of renewable energy development. Thus, this analysis focuses on renewable energy facilities and any other foreseeable large energy projects nominally covering 500 acres (2 km^2) or more or requiring amounts of water on the scale of utility-scale CSP. Figure 9.3.22.2-1 shows the approximate locations of the key projects.

Renewable Energy Development

Several recent executive and legislative actions in California have addressed renewable energy development within the state. In November 2008, Governor Schwarzenegger signed E.O. S-14-08 to streamline California's renewable energy project approval process and increase the state's RPS to the most aggressive in the nation—at 33% renewable power by 2020. On September 15, 2009, the governor issued a second E.O., now requiring that 33% of all electrical energy produced in the state be from renewable energy sources by the year 2020. The E.O. directed the CARB to adopt regulations increasing California's RPS to 33% by 2020.

In 2009, the California legislature drafted bills that would cause 33% of electrical energy production to come from renewable sources. On October 12, 2009, Governor Schwarzenegger vetoed two bills from the California Legislature on electrical energy generated by renewable sources in favor of an alternative plan that would remove limits on the amount of renewable power utilities could buy from other states (African American Environmentalist Association 2009).

Solar Energy. Table 9.3.22.2-1 lists three foreseeable solar energy projects on public land, the so-called fast-track projects—SES One (two phases—CACAs 49537 and 49539) and Chevron Energy Solutions (Lucerne) Solar Project (CACA 49561). Fast-track projects are projects on public lands for which the environmental review and public participation process is underway and the ROW applications could be approved by December 2010 (BLM 2010d). The locations of the fast-track projects are shown in Figure 9.3.22.2-1. Other, more numerous, pending regular-track ROW applications shown in the figure are discussed collectively at the end of this section.

- *Solar One Project—SES Solar #3 and SES Solar #6 (CACAs 49537 and 49539).* The proposed Solar One project would be constructed on an approximate 8,600-acre (35-km^2) site in San Bernardino County, California, within the proposed Pisgah SEZ. Construction of the 850-MW project is planned to begin in late 2010 if the project is approved by the CEC and ROW grants are issued by the BLM. Construction would take approximately 40 months to complete. The primary equipment for the generating facility would include the 25-kW Stirling solar dish systems (referred to as SunCatchers).

  The facility would be built in two phases and would be expected to operate for approximately 20 years based on the Power Purchase Agreement signed by SES with Southern California Edison (SCE). The first phase would consist of up to 20,000 SunCatchers configured in 334 units and have a net nominal generating capacity of 500 MW on 5,838 acres (24 km^2) of federal lands. The second phase would consist of approximately 14,000 SunCatchers configured in 233 units with a net generating capacity of 350 MW on 2,392 acres (9.7 km^2) of federal lands (BLM 2010d).

TABLE 9.3.22.2-1 Reasonably Foreseeable Future Actions Related to Energy Development and Distribution and Other Major Actions near the Proposed Pisgah SEZ[a]

Description	Status	Resources Affected	Primary Impact Location
Fast-Track Solar Energy Projects on BLM-Administered Land			
SES Solar Three, (Calico Solar Project SES One), (CACA-49537); 350 MW CSP dish engine facility; 3,392 total acres (14 km^2)	NOI to prepare an EIS/SA issued on June 8,2009; Draft EIS/SA issued April 19, 2010	Land use, visual, terrestrial habitats, wildlife, groundwater	Within the Pisgah SEZ
SES Solar Six (SES One) (CACA-49539); 500 MW CSP/Dish Engine facility; 5,212 total acres (21 km^2)	Application received March 14, 2007	Land use, visual, terrestrial habitats, wildlife, groundwater	Within the Pisgah SEZ
Chevron Energy Solutions (Lucerne) Solar (CACA 49561); 45 MW PV solar; 516 total acres (2 km^2)	Notice of Availability of Draft EIS/SA issued Feb. 5, 2010	Land use, visual, terrestrial habitats, wildlife, groundwater	About 30 mi (48 km) south of the Pisgah SEZ
Other Reasonably Foreseeable Solar and Hybrid Energy Projects			
Mohave Solar Power Project (CEC licensing case 09-AFC[b]-5); 250 MW parabolic trough facility; 1,765 acres (7 km^2)	Application for Certification filed with CEC Aug. 2009	Land use, visual, terrestrial habitats, wildlife, groundwater	About 40 mi (64 km) west-northwest of the Pisgah SEZ
Victorville 2 Hybrid Power Project; 563 MW; combination of natural-gas fired turbines and parabolic solar-thermal collectors; about 400 acres (1.6 km^2)	Commercial operation planned by summer of 2010	Land use, visual, visual, terrestrial habitats, wildlife, groundwater	40 to 50 mi (72 to 80 km) southwest of the Pisgah SEZ
Wind Energy Projects			
Granite Mountain Wind Energy; (CACA 48254); 73 MW 1,968 acres BLM lands, 670 acres (2.7 km^2) private lands	Draft EIS schedule delayed	Land use, visual, terrestrial habitats, wildlife	6 mi (10 km) east at Apple Valley in Granite Mountains, about 35 to 40 mi (56 to 64 km) southwest of Pisgah SEZ
Daggett Ridge Wind Energy Project (CACA 49575); 82.5 MW; 1,576 acres BLM lands, 380 private lands	Three-month delay requested in Sept. 2010 to study risks to the golden eagle	Land use, visual, terrestrial habitats, wildlife	20 mi (32 km) west of the Pisgah SEZ

TABLE 9.3.22.2-1 (Cont.)

Description	Status	Resources Affected	Primary Impact Location
Other Projects			
CalNev Oil Pipeline Expansion Project; reconstruction of existing oil pipeline to increase pipe to 16-in. (41-cm) diameter	Pending	Disturbed areas, terrestrial habitats along existing pipeline ROW	Extends along 233-mi (375-km) corridor from North Colton terminal in Santa Barbara County through the project area along I-15 from Barstow to Las Vegas

[a] Projects in later stages of development.

[b] AFC = application for certification.

Related structures for the project would include the construction of a new 230-kV substation located approximately in the center of the project site. This new substation would be connected to the existing SCE Pisgah Substation adjacent to the project site via approximately 2 mi (3 km) of single-circuit, 230-kV transmission line. In addition, the proposed project would require the SCE to expand and upgrade the existing 230-kV SCE Pisgah Substation to support the increase in voltage to 500 kV, loop the Eldorado-Lugo 500-kV line into the SCE Pisgah Substation, and demolish 65 mi (105 km) of the existing Lugo-Pisgah No. 2 230-kV transmission and replace it with towers and conductor (BLM 2010d).

A draft EIS/SA has been prepared, and the BLM issued a Notice of Availability of the document on April 2, 2010, that started a 90-day public review period (BLM 2010c).

- Chevron *Energy Solutions (Lucerne) Solar Project (CACA 49561).* Chevron Energy Solutions has requested a 516-acre (2-km^2) ROW authorization to construct and operate a 45-MW solar PV project and connect it to an existing Southern California Edison 33-kV transmission line on public lands located approximately 8 mi (13 km) east of Lucerne Valley in San Bernardino County. The proposed project would include a solar array, switchyard, a control and maintenance building, and parking area. A Notice of Availability (NOA) of the Draft EIS was published by the BLM on February 5, 2010 (BLM 2010e). The draft EIS also includes a proposed amendment to the CDCA Plan. The proposed site is located about 30 mi (48 km) south of the Pisgah SEZ.

Pending Solar ROW Applications on BLM-Administered Lands. In addition to the fast-track solar projects described above, there are a number of regular-track applications for

FIGURE 9.3.22.2-1 Locations of Renewable Energy Proposals on Public Land within a 50-mi (80-km) Radius of the Proposed Pisgah SEZ

solar project ROWs that have been submitted to the BLM for projects that would be located within 50 mi (80 km) of the SEZ. Table 9.3.22.2-2 provides a list of these other solar projects that had pending applications submitted to the BLM as of March 2010. Figure 9.3.22.2-1 shows the locations of these applications.

Within 50 mi (80 km) of the proposed Pisgah SEZ, there are 17 active solar applications, including the three fast-track projects described above. Within the boundaries of the Pisgah SEZ, there are two fast-track projects but no other applications. Four of the applications within a 50-mi (80-km) radius of the Pisgah SEZ are administered through the Needles Field Office; the rest are administered through the Barstow Field Office.

The likelihood of any of the regular-track ROW application projects actually being developed is uncertain, but is generally assumed to be less than that for fast-track applications. The projects are all listed in Table 9.3.22.2-2 for completeness and as an indication of the level of interest in development of solar energy in the region. Some number of these applications would be expected to result in actual projects. Thus, the cumulative impacts of these potential projects are analyzed in their aggregate effects.

Other Reasonably Foreseeable Solar and Hybrid Energy Projects Not on BLM Lands. The following paragraphs describe other reasonably foreseeable solar and hybrid energy projects in the vicinity of the Pisgah SEZ but not on BLM lands.

- Mohave *Solar Power Project (CEC licensing case 09-AFC-5).* The project is a solar electric generating facility proposed on about 1,765 acres (7.1 km^2) in unincorporated San Bernardino County. The site is about 40 mi (64 km) west-northwest of the Pisgah SEZ. The project would use parabolic trough technology and would have a combined nominal electrical output of 250 MW from twin, independently operable solar fields (Abengoa Solar, Inc. 2009). When the Application for Certification (AFC) was filed with the CEC in August 2009, Abengoa Solar planned for the project to commence commercial operation by the winter of 2012.

  The project is proposing interconnection to the Kramer-Cool Water 230-kV transmission line, which is owned by the SCE and located adjacent to the southern border of the project. The project would use wet-cooling towers for power plant cooling. Water for cooling tower makeup, process water makeup, other industrial uses, and potable uses would be supplied from groundwater wells. A packaged water treatment system would be used to treat the water to meet potable standards. A sanitary septic system and on-site leach field would be used to dispose of sanitary wastewater. Project cooling water blowdown would be piped to lined, on-site evaporation ponds for each plant area.

- Victorville *2 Hybrid Power Project.* In 2007, the City of Victorville submitted an AFC to construct and operate the Victorville 2 Hybrid Power Project (Victorville 2), a hybrid of natural gas–fired combined-cycle generating

TABLE 9.3.22.2-2 Pending Renewable Energy Project ROW Applications on BLM-Administered Land within 50 mi (80 km) of the Pisgah SEZ

Serial No.	Project Name	Application Received	Size (acres[a])	MW	Technology	Field Office
Solar Applications						
CACA 48741	Solar Investments, LLC	Jan. 18, 2007	8,384	800	CSP	Barstow
CACA 48742	Solar Investments, LLC	Jan. 18, 2007	10,611	1,000	CSP	Barstow
CACA 48818	First Solar (Desert Opal)	Feb. 26, 2007	15,824	1,205	PV	Barstow
CACA 48875	Dpt. Broadwell Lake, LLC	Jan. 24, 2007	8,625	500	CSP	Barstow
CACA 49004	Boulevard Associates, LLC	May 14, 2007	13,528	1,000	CSP	Needles
CACA 49424	Solel, Inc.	July 23, 2007	7,453	600	CSP	Barstow
CACA 49431	Boulevard Associates, LLC	Sept. 21, 2007	10,199	1,000	CSP	Needles
CACA 49432	PG&E	Sept. 24, 2007	5,315	800	Undecided	Needles
CACA 49537	SES Solar Three, LLC (SES One)	March 14, 2007	3,392	350	CSP/Dish engine	Barstow
CACA 49539	SES Solar Six, LLC (SES One)	March 14, 2007	5,212	500	CSP/Dish engine	Barstow
CACA 49561	Chevron Energy Solutions Co. (Lucerne)	Dec. 7, 2007	518	45	PV	Barstow
CACA 49584	Solenergis, LLC	Dec. 18, 2007	7,995	350	PV	Barstow
CACA 49585	Enxco Development, Inc.	Dec. 12, 2007	3,710	1,000	CSP	Barstow
CACA 50150	Solel, Inc. (Johnson Valley)	March 10, 2008	1,800	500	CSP/trough	Barstow
Wind Applications						
Pending Wind Site Testing						
CACA 48287	Renewergy, LLC	July 26, 2006	7,760	–[c]	Wind	Needles
CACA 49052	Atlas Gas REP	May 24, 2007	9,170	–	Wind	Barstow
CACA 49053	Alta Gas REP	May 24, 2007	1,398	–	Wind	Barstow
CACA 49881	AES Wind Generation, Inc.	–	800	–	Wind	Barstow
CACA 50711	Padoma Wind Power, LLC	March 17, 2009	23,829	–	Wind	Barstow
CACA 50896	AES Seawest, Inc.	–	1,643	–	Wind	Barstow
CACA 51767	Del Sur Wind Energy, LLC	March 24, 2010	3,849	–	Wind	Barstow
CACA 51772	Del Sur Wind Energy, LLC	March 24, 2010	21,977	–	Wind	Barstow
CACA 52148	–	–	–	–	Wind	–
CACA 52188	–	–	–	–	Wind	–

TABLE 9.3.22.2-2 (Cont.)

Serial No.	Project Name	Application Received	Size (acres[a])	MW	Technology	Field Office
Wind Applications (Cont.)						
Authorized Wind Site Testing		**Application last authorized**				
CACA 43088	AES Seawest, Inc.	Dec. 17, 2004	4,231	–	Wind	Barstow
CACA 44975	Granite Wind, LLC	Sept. 24, 2009	1,968	–	Wind	Barstow
CACA 46803	Horizon Wind Energy	Feb. 9, 2006	4,479	–	Wind	Barstow
CACA 46881	AES Wind Generation, Inc.	Aug. 26, 2005	2,929	–	Wind	Barstow
CACA 47043	West Fry Wind Energy, LLC	Aug. 2, 2005	2,449	–	Wind	Barstow
CACA 47455	Pacific Wind Development LLC, (Iberdrola)	Dec. 29, 2009	6,623	–	Wind	Barstow
CACA 48472	Powers Partners SW (enXco)	Sept. 25, 2009	10,240	–	Wind	Barstow
CACA 48667	Oak Creek Energy	Aug. 11, 2006	25,600	–	Wind	Needles
CACA 48689	Renewergy, LLC, Sierra Renewables, LLC	Jan. 9, 2007	4,046	–	Wind	Barstow
CACA 49202	Verde Resources, Inc (Western Wind)	April 3, 2009	3,295	–	Wind	Barstow
CACA 49204	Horizon Wind Energy	July 19, 2007	24,390	–	Wind	Barstow
CACA 49255	EC&R West, LLC (Airtricity, Inc.)	Jan. 14, 2010	14,080	–	Wind	Barstow
Pending Wind Development Facility						
CACA 48902	West Fry Wind, LLC (FPL Energy)	March 29, 2007	3,248	34	Wind	Barstow
CACA 50612	AES Wind Generation, Inc.	Dec. 29, 2008	4,168	–	Wind	Barstow
CACA 51581	Pacific Wind (Iberdrola)	Dec. 29, 2009	6,630	–	Wind	Barstow
CACA 51605	Horizon Wind Energy	Dec. 29, 2009	150	–	Wind	Barstow

[a] Information taken from pending and authorized wind energy projects listed on BLM California Desert District Web site (BLM 2009g) and downloaded from *GeoCommunicator* (BLM and USFS 2010c). Total 14 Solar acres = 102,566 Total Solar MW = 9,650; total wind acres and MW not available.

[b] To convert acres to km^2, multiply by 0.004047.

[c] A dash indicates data not available.

equipment integrated with solar thermal generating equipment, in the City of Victorville, San Bernardino County (CEC 2009b). The proposed project would have a net electrical output of 563 MW, with construction planned to begin in summer of 2008 and commercial operation planned by summer of 2010.

Primary equipment for the generating facility would include two natural gas–fired combustion turbine-generators (CTGs) rated at 154 MW each, two heat recovery steam generators (HRSGs), one steam turbine-generator (STG) rated at 268 MW, and 250 acres (1 km^2) of parabolic solar-thermal collectors with associated heat transfer equipment. The solar-thermal collectors would contribute up to 50 MW of the STG's 268 MW output. Construction of the proposed plant would require three areas totaling 388 acres (1.6 km^2) located immediately north of the Southern California Logistics Airport. The project site is about 45 to 50 mi (72 to 80 km) SW of the Pisgah SEZ (CEC 2009b).

The proposed Victorville 2 facility would connect via a single-circuit, three-phase 230-kV transmission line to the power grid through SCE's existing Victor Substation, located approximately 10 mi (16 km) south-southwest of the proposed project site. Natural gas would be delivered to the project through an existing 24-in (61-cm) diameter natural gas pipeline. About 3,150 ac-ft/yr (0.4 million m^3/yr) of reclaimed water supplied via a new 1.5-mi (2.4-km) long, 14-in. (35.6-cm) diameter pipeline from a treatment plant southeast of the proposed site would be used for process water. Potable water would be supplied by a new on-site well. Process wastewater would be treated using a zero liquid discharge system. Sanitary waste would be sent to a treatment plant in a new 1.25-mi (2-km) sanitary wastewater line.

Wind Energy. The following paragraphs briefly describe two reasonably foreseeable wind energy developments and provide an indication of the number of other pending wind ROW applications for locations within 50 mi (80 km) of the Pisgah SEZ.

- *Granite* Mountain *Wind Energy Project (CACA 48254).* In September 2009, the BLM announced that it was developing a joint Environmental Impact Statement/Environmental Impact Report (EIS/EIR) and plan amendment with the County of San Bernardino for the development and operation of a wind energy project on 1,968 acres (8 km^2) of BLM-administered land and 670 acres (2.7 km^2) of private lands in the Granite Mountains, about 6 mi (10 km) east of the Apple Valley town limits, in San Bernardino County (BLM 2009e). The proposed site is 35 to 40 mi (56 to 64 km) southwest of the Pisgah SEZ.

  The project would consist of up to 28 Siemens (or similar) 2.3-MW wind turbine generators, a main access road from the east (off Johnson Road), other internal access roads, pad-mounted transformers, an underground electrical collection system, a project substation, overhead transmission line, an interconnection to the existing SCE's Pisgah No. 1 230-kV transmission line, an operations and maintenance building, two meteorological towers, a temporary office, and a temporary staging area. The project would be located on about 1,970 acres (8 km^2) of public lands administered by the Barstow Field Office of the BLM and 670 acres (2.7 km^2) of privately owned land under county land use jurisdiction (BLM 2009e). The Granite Mountain Wind Energy Project is one of the fast-track projects for review/approval by the BLM and the CEC. On April 2, 2010, a NOA of the Draft EIS was published in the *Federal Register* (BLM 2010f**)**.

- *Daggett Ridge Wind Energy Project (CACA 49575).* The proposed fast-track project would be comprised of 33 GE, or similar, 2.5-MW wind turbine generators, a substation, an overhead transmission line, an interconnection to the existing Southern California Edison 115-kV transmission line, and other structures. Construction of the the project would take 9 to 11 months. The project would be located 11 mi (18 km) southeast of Barstow and 5 mi (8 km) southwest of Daggett in San Bernardino County.

- *Other Wind Energy Projects.* The BLM has received numerous applications for right-of-way grants for wind energy projects that, if developed, would be within 50 mi (80 km) of the proposed Pisgah SEZ. These ROW applications include as many as 10 pending authorizations of wind site testing, 12 authorized for wind site testing, and 4 pending wind development facilities. Most of the applications are the responsibility of the BLM Barstow Field Office (BLM 2010b). Many of the projects are in the early planning stages and were first submitted to the BLM for review and approval between 2004 and 2007. Many of these projects may not be developed because of lack of financing or approval constraints. Eight wind testing projects are pending approval by the BLM Needles Field Office, two of which would be located in the Bristol Mountains about 30 to 35 mi (48 to 56 km) east of the proposed Pisgah SEZ (BLM 2009d).

Transmission and Distribution. No new transmission lines are planned that would cross the proposed Pisgah SEZ. Transmission line connections to existing lines or new line upgrades for projects within the geographic extent of effects are included with the specific project descriptions.

9.3.22.2.2 Other Actions

Other Foreseeable Actions

CalNev Oil Pipeline Expansion Project. Calnev Pipe Line, LLC, has applied for a ROW on public lands to expand and reconstruct 233 mi (375 km) of pipeline in California and Nevada. The existing CalNev system delivers petroleum products to the Las Vegas area through two existing pipelines from the North Colton terminal in Colton, California, to Bracken Junction in Las Vegas, Nevada.

The project would include construction, operation, and maintenance of a new 16-in. (41-cm) diameter pipeline from Colton to Las Vegas; new pumps, an electrical substation, and other ancillary facilities to increase pumping at Colton; a new pump station, electrical substation, and ancillary facilities at Baker; and new or modified connections to existing laterals. Pipeline construction was anticipated to occur over 12 months and was anticipated to begin in late 2009 or early 2010.

The County of San Bernardino is the lead agency for conducting an environmental review of the project. A Notice of Intent to prepare a draft EIS and draft EIR was issued in March 2007 (SBC 2008).

9.3.22.3 General Trends

9.3.22.3.1 Population Growth

Table 9.3.22.3-1 presents recent and projected populations in San Bernardino County and in the state as a whole. Population in the county stood at 2,086,465 in 2008, having grown at an average annual rate of 2.4% since 2000. Population growth in the county was higher than that for

TABLE 9.3.22.3-1 ROI Population for the Proposed Pisgah SEZ

Location	2000	2008	Average Annual Growth Rate, 2000–2008 (%)	2021	2023
San Bernardino County	1,721,942	2,086,465	2.4	2,619,128	2,694,641
California	34,105,437	38,129,628	1.4	44,646,420	45,667,413

Sources: U.S. Bureau of the Census (2009c); California Department of Finance (2010).

California as a whole (1.4%) over the same period. The county population is expected to increase to 2,619,128 by 2021 and to 2,694,641 by 2023 (California Department of Finance 2010).

9.3.22.3.2 Energy Demand

The growth in energy demand is related to population growth through increases in housing, commercial floorspace, transportation, manufacturing, and services. Given that population growth is expected in Imperial, Riverside, and San Bernardino Counties between 2006 and 2016, an increase in energy demand is also expected. However, the EIA projects a decline in per-capita energy use through 2030, mainly because of improvements in energy efficiency and the high cost of oil throughout the projection period. Primary energy consumption in the United States between 2007 and 2030 is expected to grow by about 0.5% each year, with the fastest growth projected for the commercial sector (EIA 2009).

9.3.22.3.3 Water Availability

The proposed Pisgah SEZ is located within the Mojave Desert, which is characterized by extreme daily temperature ranges with low precipitation and humidity (CDWR 2009); annual precipitation is between 4 and 6 in./yr (10 and 15 cm/yr) (MWA 2004; Mathany and Belitz 2008).

The primary surface-water features within the SEZ are several ephemeral drainages coming off the Cady Mountains and the Lava Bed Mountains that drain toward the Troy Lake area. Troy Lake is a dry lake consisting of playa and dune sediments that covers approximately 3,500 acres (14 km^2); approximately 1,550 acres (6 km^2) of this dry lake is within the boundaries of the SEZ. In addition, the Lavic Lake dry lakebed is located 5 mi (8 km) to the southeast.

The Mojave River is an intermittent river that flows into the Mojave Desert. The reach of the Mojave River that is closest to the SEZ is located 7 mi (11 km) to the north and is typically dry at the surface except during large rainfall events (Lines 1996). No wetlands have been identified within the SEZ according to the NWI (USFWS 2009a).

The SEZ is located within two groundwater basins: Lavic Valley and Lower Mojave River Valley. The Pisgah Fault is suspected to act as a groundwater barrier (CDWR 2003) that separates the two groundwater basins. There are two primary aquifers of the Mojave River: the floodplain and regional aquifers. The floodplain aquifer consists of highly permeable deposits of sand and gravel on the order of 200 ft (60 m) in thickness and extends into the SEZ to include Troy Lake. The regional aquifer consists of unconsolidated to partially consolidated sand, silt, and gravel deposits up to 2,000 ft (610 m) in thickness (Stamos et al. 2001; Izbicki 2004).

Seepage from the Mojave River is the primary recharge source for the floodplain and regional aquifers of the Lower Mojave groundwater basin. Additional recharge comes from direct precipitation, percolation of runoff from surrounding mountains, irrigation returns, and artificial recharge (CDWR 2003). Estimates of recharge vary depending upon the time frame examined, with the average annual recharge to the Lower Mojave Valley groundwater basin estimated to range from 7,400 ac-ft/yr (9 million m^3/yr) to 15,914 ac-ft/yr (19.6 million m^3/yr) for the analysis periods of 1931 to 1990 and 1937 to 1961, respectively (Stamos et al. 2001). Estimates of recharge for the Lavic Valley groundwater basin are not as well quantified because of the lack of development in this region. The natural recharge is estimated to be approximately 300 ac-ft/yr (0.4 million m^3/yr) for the Lavic Valley region (CDWR 2003).

Groundwater discharge by evapotranspiration and underflow is estimated to be approximately 1,000 ac-ft/yr (1.2 million m^3/yr) each for the Lower Mojave Valley groundwater basin on the basis of a groundwater model for 1994 conditions (Stamos et al. 2001). Groundwater discharge processes have not been quantified in the Lavic Valley groundwater basin.

Groundwater withdrawals in the Lower Mojave Valley groundwater basin have been primarily used to support agriculture dating back to the early 1900s. In 1931, groundwater withdrawals were approximately 5,000 ac-ft/yr (6.1 million m^3/yr); they quickly rose to around 50,000 ac-ft/yr (61.7 million m^3/yr) in the mid-1960s and reached a maximum of 60,000 ac-ft/yr (74 million m^3/yr) in the mid-1990s (Stamos et al. 2001). Groundwater withdrawals are currently limited to less than 40,000 ac-ft/yr (49 million m^3/yr), and this limit is decreasing because of groundwater management by adjudication (MWA 2009; see Section 9.3.9.1.3 for further details).

Groundwater well yields range from 80 to 140 gpm (303 to 530 L/min) in the Lavic Valley groundwater basin and from 10 to 2,700 gpm (38 to 10,220 L/min), with an average of 480 gpm (1817 L/min) in the Lower Mojave groundwater basin (CDWR 2003).

Evidence of groundwater overdraft with decreasing groundwater elevations has been recognized in the Mojave River region since the mid-1950s (MWA 2004). Groundwater surface elevations have declined at rates ranging from 0.8 to 1.3 ft/yr (0.2 to 0.4 m/yr) over the past decade near Troy Lake and are currently around 60 ft (18 m) below the surface (USGS 2009; well numbers 344956116352901, 345001116381701, 345053116344701, 345104116384002, 345109116332401, and 345142116332601). In other portions of the Lower Mojave Valley groundwater basin, groundwater levels currently range between 120 and 160 ft (37 and 49 m) below the surface (MWA 2009).

In 2005, water withdrawals from surface waters and groundwater in San Bernardino County were 656,900 ac-ft/yr (860 million m^3/yr), of which 57% came from surface waters and 43% came from groundwater. The largest water use category was municipal and domestic supply, at 427,100 ac-ft/yr (527 million m^3/yr). However, the majority of this water is used in the larger cities located in the southwestern portion of San Bernardino County. Agricultural water uses accounted for 167,000 ac-ft/yr (206 million m^3/yr), while industrial and thermoelectric water uses accounted for 29,150 and 33,630 ac-ft/yr (36 million and 41 million m^3/yr), respectively (Kenny et al. 2009). Consumptive water use in the rural areas near the proposed SEZ totaled 26,400 ac-ft/yr (32.5 million m^3/yr) in 2001, with 58% for agricultural use, 24% for industrial use, and 9% each for municipal and recreational uses (MWA 2004; Baja region).

9.3.22.3.4 Climate Change

Global warming continues to affect many desert areas in the Southwest with increased temperatures and prolonged drought during the past 20 to 30 years. A report on global climate change in the United States prepared on behalf of the National Science and Technology Council by the U. S. Global Research Program (GCRP 2009) documents current temperature and precipitation conditions and historic trends, and projects impacts during the remainder of GHG emissions. The report summarizes the science of climate change and the recent and future impacts of climate change on the United States. The following excerpts from that report indicate there has been a trend for increasing global temperature and decrease in annual precipitation in desert regions:

- Average temperature in the U.S. increased more than 2ºF (1.1ºC) over the period of 1957 to 2007.

- Southern areas, particularly desert regions of southern Arizona and southeastern California, have experienced longer drought and are projected to have more severe periods of drought during the remainder of the twenty-first century. Much of the Southwest has experienced drought conditions since 1999. This period represents the most severe drought in 110 years.

- The incidence of wildfires in the western United States has increased in recent decades, partly because of increased drought.

- Temperature increases in the next 20 to 30 years are expected to be strongly correlated with past emissions of heat-trapping gases, such as CO_2 and methane.

- Many extreme weather events have increased both in frequency and intensity during the last 40 to 50 years. Precipitation and runoff are expected to decrease in the Southwest in spring and summer based on current data and anticipated temperature increases. Water use will increase over the next several decades as the population of southern California grows, resulting in tradeoffs between competing uses.

- Climate project models also show a 10 to 20% decline in runoff in California and Nevada for the period 2041 to 2060 compared with data from 1901 to 1970 used as a baseline.

- In the Southwest, average temperatures increased about 1.5ºF (0.8ºC) in 2000 compared with a baseline period of 1960 to 1979. By the year 2020, temperatures are projected to rise 2 to 3ºF (1.1 to 1.7ºC) above the 1960 to 1979 baseline.

Increased global temperatures from GHG emissions will likely continue to exacerbate drought in the southern California deserts. The State of California has prepared several reports on climate change impact predictions through the remainder of the twenty-first century. Those reports address topics such as economics, ecosystems, water use/availability, impacts on Santa Ana winds, agriculture, timber production, and snowpack. The California climate change portal Web site (http://www.climatechange.ca.gov/publications/cat/index.html) lists the Climate Action Team reports that are submitted to the governor and state legislature. These reports are included as final papers of the CEC's Public Interest Energy Research Program.

9.3.22.4 Cumulative Impacts on Resources

This section addresses potential cumulative impacts in the proposed Pisgah SEZ on the basis of the following assumptions: (1) because of the relatively large size of the proposed SEZ (more than 10,000 acres [40.5 km^2] but less than 30,000 acres [121 km^2]), as many as two projects could be constructed at a time, and (2) maximum total disturbance over 20 years would be about 19,160 acres (345 km^2) (80% of the entire proposed SEZ). For analysis, it is also assumed that no more than 3,000 acres (12.1 km^2) would be disturbed per project annually and 250 acres (1.01 km^2) monthly on the basis of construction schedules planned in current applications. Two existing high-capacity transmission lines (230 and 500 kV) run through the SEZ; therefore, for this analysis, the impacts of construction and operation of new transmission were not assessed. Regarding site access, because I-40 runs from east to west through the SEZ, no major road construction activities outside of the SEZ would be needed for development to occur in the SEZ.

Cumulative impacts in each resource area that would result from the construction, operation, and decommissioning of solar energy development projects within the proposed SEZ when added to other past, present, and reasonably foreseeable future actions described in the previous section are discussed below. At this stage of development, because of the uncertainties of the future projects in terms of location within the proposed SEZ, size, number, and the types of technology that would be employed, the impacts are discussed qualitatively or semi-quantitatively, with ranges given as appropriate. More detailed analyses of cumulative impacts would be performed in the environmental reviews for the specific projects in relation to all other existing and proposed projects in the geographic areas.

9.3.22.4.1 Lands and Realty

The area covered by the proposed Pisgah SEZ is a rural and largely undeveloped portion of the western Mojave Desert region. The SEZ consists only of BLM-administered public lands that interface private lands in the area. About 380 acres (1.5 km^2) of state land border the SEZ. There are numerous existing ROW authorizations in the SEZ (Section 9.3.2.1), including I-40, a railroad line, a fiber optic line, four large transmission lines, an electrical substation, four pipelines, and a county road that provides access to a mine surrounded by the SEZ. A Section 368 designated energy corridor roughly follows the route of I-40 trough the SEZ.

Development of the SEZ would introduce a new and discordant land use into an area that is largely rural. In addition, numerous other renewable energy projects are proposed within a

50-mi (80-km) radius of the Pisgah SEZ. As shown in Table 9.3.22.2-2 and Figure 9.3.22.2-1, as many as 14 other solar projects and 26 wind projects have been authorized or have pending applications within this distance. ROW applications totaling more than 9,000 acres (36 km^2) are in place for three fast-track solar proposals, two of which lie within the proposed SEZ (Section 9.3.22.2.1). A far larger area could ultimately be developed for renewable energy projects. As a result of the potential and likely development of other renewable energy projects and accompanying transmission lines, roads, and other infrastructure within the geographic extent of effects, the character of a large portion of the California Desert could be dramatically changed. The contribution to cumulative impacts of utility-scale solar projects on public lands on and around the Pisgah SEZ could be significant, particularly if the SEZ is fully developed with solar projects. Development of the public lands for solar energy production may also result in similar development on the state and private lands in the immediate vicinity of the SEZ.

Construction of utility-scale solar energy facilities within the SEZ would preclude use of those areas occupied by the solar energy facilities for other purposes. The areas that would be occupied by the solar facilities would be fenced, and access to those areas by both the general public and wildlife would be eliminated.

9.3.22.4.2 Specially Designated Areas and Lands with Wilderness Characteristics

The proposed Pisgah SEZ is surrounded by areas of high wilderness and scenic value, including four designated WAs, a WSA, and numerous ACECs with a potential view of the SEZ within 25 mi (40 km) (Section 9.3.3.1). The Pisgah ACEC is located along the eastern boundary of the SEZ, and the Ord-Rodman DWMA is located along the southwestern boundary, while other ACECs lie nearby. Construction of utility-scale solar energy facilities within the SEZ in combination with potential development of other renewable energy projects and associated infrastructure would contribute to the adverse visual impacts on these specially designated areas. Development of the SEZ, especially full development, would be a dominant factor in the viewshed from large portions of these specially designated areas.

Solar development of the proposed Pisgah SEZ, together with that within the geographic extent of effects, would combine to adversely affect wilderness values in the nearby WAs. The I-40 corridor to the east and west of the Pisgah SEZ, in particular, has a large number of pending wind and solar applications that may result in cumulative effects on sensitive areas in those regions.

9.3.22.4.3 Rangeland Resources

The SEZ includes only one grazing allotment, which is being relinquished. Since there would be no effect on livestock grazing, solar development of the area would not contribute to any cumulative effects on livestock grazing. Likewise, since the SEZ is not located within or near either an HA or HMA, there would be no contribution to any adverse effects on wild horses or burros.

9.3.22.4.4 Recreation

The proposed Pisgah SEZ is flat and is of a type and quality that generally does not attract recreational users. However, access into the area is easy, and low levels of recreational use would occur, including backcountry driving, rockhounding, and seasonal nature hikes. It is anticipated there would not be a significant loss of recreational use caused by development of the Pisgah SEZ, although some users would be displaced.

When SEZ development is considered in combination with other potential renewable energy development within the region, the potential would exist for cumulative visual impacts on recreational users of the specially designated areas surrounding the SEZ (Section 9.3.22.4.2) and for users who enjoy backcountry driving. There is substantial potential for loss of wilderness and scenic values throughout the California Desert wherever solar and wind energy development encroaches on wilderness or on other currently undeveloped areas. The overall cumulative impacts on recreational use associated with the loss of wilderness values and general open desert scenery also could be large. While the effects cannot be quantified, desert users might avoid areas dominated by industrial-type solar facilities. This could result in a fundamental change in the way the California Desert has been traditionally used.

9.3.22.4.5 Military and Civilian Aviation

The proposed Pisgah SEZ is completely blanketed under eight MTRs, which are part of a very large, interconnected system of training routes throughout the southwest. The development of any solar energy or transmission facilities that encroach into the airspace of MTRs could create safety issues and could conflict with military training activities. While advance consultation with the DoD is required prior to approval of activities that could adversely affect the use of the MTRs, the military has indicated that solar development on portions of the Pisgah SEZ is compatible with its existing uses regardless of the proposed heights of solar facilities, while other portions should have height limits, and some areas may be incompatible with existing military use. Potential solar development occurring throughout the region, which is currently undeveloped, could result in cumulative effects on the larger system of MTRs. Such effects would be limited by mitigations developed in consultation with the military. With potential solar development occurring throughout the region, not just in SEZs, maintaining a large-picture view of the overall effects on the system of MTRs will be necessary to avoid cumulative effects. Potential effects on military use of military airspace could be limited by mitigation developed in consultation with the military.

9.3.22.4.6 Soil Resources

Ground-disturbing activities (e.g., grading, excavating, and drilling) during the construction phase of a solar project, including any associated transmission lines, would contribute to the soil loss due to erosion. Construction of new roads within the SEZ or improvements to existing roads would also contribute to soil erosion. During construction, operations, and decommissioning of the solar facilities, worker travel and other road use would also contribute to soil loss. These losses would be in addition to losses occurring as a result of disturbance caused by other users in the area, including the potential construction of several other renewable energy facilities, and recreational users, such as off-road vehicle enthusiasts. As discussed in Section 9.3.7.3, programmatic design features would be employed to minimize erosion and loss of soil during the construction, operation, and decommissioning phases of the solar facilities and any associated transmission lines. Landscaping of solar energy facility areas could alter drainage patterns and lead to increased siltation of surface-water streambeds, in addition to that caused by other development activities. Even with the expected design features in place, cumulative impacts from the disturbance of several large sites and connecting linear facilities in the vicinity could be significant.

9.3.22.4.7 Minerals (Fluids, Solids, and Geothermal Resources)

Currently, there are 103 mining claims (lode, placer, and millsite) within the proposed Pisgah SEZ, most of which are located in the southern portion of the SEZ south of I-40. There are no oil and gas or geothermal leases within the proposed SEZ, while the area remains open for discretionary mineral leasing.

Existing mining claims would preclude solar energy development and could prevent solar development in some areas as long as they are in place. Where solar development can proceed, there would be no expected loss of mineral production. The cumulative effects of future renewable energy development on mineral production within the geographic extent of effects is similarly expected to be small, as existing claims would not be affected.

9.3.22.4.8 Water Resources

The water requirements for development and operation of various utility-scale solar energy technologies on the proposed SEZ are described in Sections 9.3.9.2. If the SEZ were fully developed over 80% of its available land area, the amount of water needed during the peak construction year for the various solar technologies evaluated would be 1,745 to 2,566 ac-ft (2,200 to 3,200 thousand m^3). The amount of water needed during decommissioning would be similar to or less than the amount used during construction. During operations, the amount of water needed for all solar technologies evaluated would range from 108 to 57,500 ac-ft/yr (0.13 to 71 million m^3/yr), with PV representing the lower end of this range. Since the availability of groundwater (the primary water resource available to solar energy facilities in the SEZ) is limited, it would not be feasible to obtain the upper end of the water requirements range.

The levels of water use needed for build-out with wet cooling are clearly not feasible for the water resources available in the region. In areas of the SEZ that would draw groundwater from the Lavic Valley basin, about 80% of the SEZ, only PV would be sustainable under roughly estimated recharge rates of only about 300 ac-ft/yr (0.37 million m^3/yr) (Section 9.3.9.2.2).

Currently two fast-track applications for development of a solar energy project within the Pisgah SEZ are pending (Table 9.3.22.2-2). Considering technology-specific water use rates

(Section 9.3.9) and assuming dish-engine technology, such a facility could require up to 60,000 ac-ft/yr (74 million m^3/yr) if wet cooled, or 430 ac-ft/yr (0.53 million m^3/yr). This use rate could be sustainable even in the Lavic Valley basin, assuming the application of water conservation measures.

The development of the third fast-track solar project within the geographic extent of effects, CACA 49561, a proposed 45-MW PV facility about 30 mi (48 km^2) southwest of the SEZ (Section 9.3.22.2.1), would draw minimal water and not contribute to cumulative impacts. However, the several pending solar energy project proposals for locations on or within a few miles east and southeast of the SEZ (Figure 9.3.22.2-1), if approved, could draw from the Lavic Valley groundwater basin and thus contribute to cumulative impacts within the SEZ. Therefore, cumulative impacts on groundwater basins underlying the Pisgah SEZ from currently foreseeable projects within the geographic extent of effects could be moderate.

With respect to wastewaters, the small quantities of sanitary wastewater that would be generated during the construction and operation of utility-scale solar energy facilities within the Pisgah SEZ in combination with similarly small volumes from other foreseeable projects would not be expected to strain available sanitary wastewater treatment facilities in the general area of the SEZ. Blowdown water from cooling towers for wet-cooled technologies would be treated within a project site (e.g., in settling ponds) and injected into the ground, released to surface water bodies, or reused, and thus would not contribute cumulative impacts to any nearby treatment systems.

9.3.22.4.9 Vegetation

The proposed Pisgah SEZ is located within the Mojave Basin and Range ecoregion, which primarily supports creosotebush (*Larrea tridentata*) habitats. Annual precipitation in the Mojave Desert occurs primarily in winter and averages only about 4.1 in. (105 mm) in the area of the SEZ. No wetlands occur within the SEZ or within the 5-mi (8-km) area of indirect effects. Troy Lake, a dry lakebed located in the western portion of Pisgah, occasionally holds shallow surface water and is sparsely vegetated. Troy Lake is primarily classified as North American Warm Desert Playa. If utility-scale solar energy projects were to be constructed within the SEZ, all vegetation within the footprints of the facilities would likely be removed during land-clearing and land-grading operations.

Numerous other renewable energy projects are proposed within a 50-mi (80-km) radius of the proposed Pisgah SEZ. As many as 14 other solar projects and 26 wind projects have authorized or pending applications within this distance. ROW applications totaling more than 9,000 acres (36 km^2) are in place for three fast-track solar proposals, two of which lie within the proposed SEZ (Section 9.3.22.2.1). Depending on the actual development of renewable energy projects within and outside the SEZ and accompanying transmission lines, roads, and other infrastructure within the geographic extent of effects, cumulative impacts on certain cover types could occur, particularly those that favor the creosote flats, which are suitable for solar facilities. Rare and sensitive cover types present in the SEZ might also be affected cumulatively, including Inter-Mountain Basins Shale Badland and North American Warm Desert Pavement. Other, less common, potentially affected cover types include North American Warm Desert Volcanic Rockland and North American Warm Desert Playa. In addition, groundwater withdrawals near Troy Lake playa could further deplete the Lower Mojave Valley regional groundwater system and affect discharges at springs and seeps along the Mojave River that support riparian habitats, which could cumulatively degrade these habitats.

In addition, the cumulative effects of fugitive dust generated during the construction of solar facilities along with other activities in the area, such as transportation and recreation, could increase the dust loading in habitats outside a solar project area, which could result in reduced productivity or changes in plant community composition. Programmatic design features would be implemented to reduce the impacts from solar energy projects and thus reduce the overall cumulative impacts on plant communities and habitats.

9.3.22.4.10 Wildlife and Aquatic Biota

As many as 166 species of wildlife, including amphibians (1 species), reptiles (30 species), birds (100 species), and mammals (35 species), occur in and around the proposed Pisgah SEZ (Section 9.3.11). The construction of utility-scale solar energy projects in the SEZ and of any associated transmission lines and roads in or near the SEZ would have impacts on wildlife through habitat disturbance (i.e., habitat reduction, fragmentation, and alteration), wildlife disturbance, loss of connectivity between natural areas (e.g., habitat fragmentation and blockage of dispersal corridors for bighorn sheep and desert tortoise), and wildlife injury or mortality. In general, affected species that have broad distributions and occur in a variety of habitats would be less affected than species with a narrowly defined habitat within a restricted area. Programmatic design features include pre-disturbance biological surveys to identify key habitat areas used by wildlife, followed by avoidance or minimization of disturbance to those habitats (e.g., avoiding development in Homer Wash).

As many as 14 other solar projects and 26 wind projects have authorized or pending applications within 50 mi (80 km) of the SEZ. ROW applications totaling more than 9,000 acres (36 km^2) are in place for three fast-track solar proposals, two of which lie within the proposed SEZ (Section 9.3.22.2.1). Depending on the actual development of renewable energy projects within and outside the SEZ and of accompanying transmission lines, roads, and other infrastructure within the geographic extent of effects, cumulative impacts on some wildlife species could be significant, particularly those with habitats or migratory routes in the basin flats, which are suitable for solar facilities.

While many of the wildlife species have extensive habitat available within the affected counties, where projects are closely spaced, the cumulative impact on a particular species could be moderate to large. Current applications for solar and wind projects are mainly clustered along the I-40 corridor, where cumulative impacts would be greatest. Programmatic design features would be used to reduce the impacts from solar energy projects and thus reduce the overall cumulative impacts on wildlife. However, even with mitigations in place, cumulative impacts could be moderate within the geographic extent of effects.

Because no wetlands are present within the proposed SEZ or within a 5-mi (8-km) radius of indirect effects, and Troy Lake is normally dry, no aquatic biota are present within the SEZ. Thus, there would be no cumulative impacts on aquatic biota and habitats resulting from solar development within the SEZ. Increased future demand on groundwater for multiple uses, including solar power development within the SEZ, could affect surface-water levels outside of the SEZ, including the Mojave River, and cumulatively affect aquatic organisms in those water bodies.

9.3.22.4.11 Special Status Species (Threatened, Endangered, Sensitive, and Rare Species)

Seven special status species are known to occur within the affected area of the proposed Pisgah SEZ: desert tortoise, which is listed as threatened under the ESA and CESA; white-margined beardtongue, Mojave fringe-toed lizard, Bendire's thrasher, and Nelson's bighorn sheep, which are BLM-designated sensitive species; and Emory's crucifixion-thorn and small-flowered androstephium, which are considered rare species. Numerous additional species occurring on or in the vicinity of the SEZ are listed as threatened or endangered by the State of California or are listed as a sensitive species by the BLM. Programmatic design features that could be used to reduce or eliminate the potential for cumulative effects on these species from the construction and operation of utility-scale solar energy projects within the geographic extent of effects include avoidance of habitat, translocation of individuals, and minimization of erosion, sedimentation, and dust deposition.

Numerous reasonably foreseeable future actions could occur within the geographic extent of effects of the proposed Pisgah SEZ, including as many as 14 other solar projects and 26 wind projects, which have authorized or pending applications within this distance. Three fast-track solar proposals covering more than 9,000 acres (36 km^2) lie with the geographic extent of effects, and two of these lie within the SEZ. Many or all of the special status species found within the proposed Pisgah SEZ are also likely to be present at the locations of other renewable energy projects, particularly solar projects located in creosote flats. However, projects in these and other areas would employ design features to reduce or eliminate the impacts on protected species as required by the ESA and other applicable federal and state laws and regulations.

Depending on the number and size of other projects that will actually be built in the next 20 to 30 years within the geographic extent of effects, there could be cumulative impacts on protected species due to habitat destruction and overall development and fragmentation of the area. Habitats that are particularly at risk are those in basin flats suited for solar development. In particular, the functioning of the Chemehuevi DWMA could be cumulatively affected with respect to connectivity, control of desert tortoise disease, and predation. Together, several new solar facilities and the other associated actions would have a cumulative impact on wildlife. Where projects are closely spaced, particularly along the I-40 corridor, moderate cumulative impact on a particular species could occur.

9.3.22.4.12 Air Quality and Climate

While solar energy generates minimal emissions compared with fossil fuel–generated energy, the site preparation and construction activities associated with solar energy facilities would produce some emissions, mainly particulate matter (fugitive dust) and engine exhaust emissions from construction equipment and vehicles. When these emissions are combined with those from other projects near solar energy facilities or when they are added to natural dust generated by winds and wind erosion, the air quality in the general vicinity of the projects could be temporarily degraded. For example, particulate matter (dust) concentration at or near the SEZ boundaries could at times exceed state or federal ambient air quality standards. Generation of dust from construction activities can be partially controlled by implementing aggressive dust control measures, such as increased watering frequency or road paving or treatment, and/or sound practices such as minimizing activities under unfavorable meteorological conditions.

Numerous other renewable energy projects are proposed or planned within the air basin shared by Pisgah (Section 9.3.22.2.1 and Figure 9.3.22.2-1). Three fast-track solar proposals covering more than 9,000 acres (36 km^2) lie with the geographic extent of effects, two within the SEZ, while a total of 14 solar and 26 wind proposals have authorized or pending applications within 50 mi (80 km) of the proposed Pisgah SEZ. The fast-track projects could have overlapping construction schedules, since they would be expected to be constructed roughly in 2011 to 2013. These projects, in combination with others with pending applications, could produce periods of elevated particulate matter and engine exhaust emissions in the affected area. Due to predominant westerly winds (more than 70% of the time), potential impacts on residences and communities, which are mainly upwind of the SEZ, would be relatively small.

Over the long term and across the region, the development of solar energy may have beneficial cumulative impacts on the air quality and atmospheric values in southern California by offsetting the need for energy production with fossil fuels, which result in higher levels of emissions. As discussed in Section 9.3.13, air emissions from operating solar energy facilities are relatively minor, while the displacement of criteria air pollutants, VOCs, TAPs, and GHG emissions currently produced from fossil fuels could be relative large. For example, if the Pisgah SEZ were fully developed (80% of its acreage) with solar facilities, the quantity of pollutants avoided could be as large as 6.3% of all emissions from the current electric power systems in California (Section 9.3.13.2.2).

9.3.22.4.13 Visual Resources

The proposed Pisgah SEZ is located within the east–west trending Mojave Valley, which is relatively flat and is characterized by wide open views. Generally good air quality allows visibility for 50 mi (80 km) or more under favorable atmospheric conditions. The proposed SEZ site is a largely treeless plain, with the northeastern portion sloping upward toward the Cady Mountains; Pisgah Crater is located on the south border of the site. Surrounding mountain ranges generally block views to and from neighboring valleys, while the view is more open to the east of the SEZ. Within the valley, views are afforded of the SEZ, the rest of the valley, and the surrounding mountains. The VRI classes for the SEZ are VRI Class II, indicating high relative visual values, Class III, indicating moderate relative visual values, and Class IV, indicating low relative visual values. The VRI values indicate moderate sensitivity associated with a moderate level of use, largely due to traffic on I-40 and U.S. Route 66, and a moderate level of public interest, due primarily to national interest in U.S. Route 66. Special area sensitivity is ascribed to the SEZ due to its inclusion within the CDCA. The site is also visible from several ACECs and in general is close to several other specially designated areas, indicating moderate visual sensitivity.

Development of utility-scale solar energy projects within the SEZ would contribute to the cumulative visual impacts in the general vicinity of the SEZ and in the Mohave Valley. However, the exact nature of the visual impacts and the design features that would be appropriate would depend on the specific project locations within the SEZ and on the solar technologies used. Such impacts and potential design features would be considered in visual analyses conducted for specific future projects. In general, large visual impacts on the SEZ would be expected to occur as a result of the construction, operation, and decommissioning of utility-scale solar energy projects. These impacts would be expected to involve major modification of the existing character of the landscape and would likely dominate the views for some nearby viewers. Additional impacts would occur as a result of the construction, operation, and decommissioning of related facilities, such as access roads and electric transmission lines.

Some lands outside the SEZ would also be subjected to visual impacts related to the construction, operation, and decommissioning of utility-scale solar energy development, due to the large size of such facilities, the large number of pending applications on public lands in the area, and the relatively flat, open nature of the proposed SEZ. Potential impacts would include night sky pollution, including increased skyglow, light spillage, and glare. Some of the affected lands outside the SEZ would include potentially sensitive scenic resource areas, including the four WAs, two WSAs, the Old Spanish National Historic Trail, and the CDCA. These sensitive visual resource areas would be subject to major to minimal visual impacts. Visual impacts resulting from solar energy development within the SEZ would be in addition to impacts caused by other potential projects in the area, such as other solar facilities on private lands, transmission lines, and other renewable energy facilities, including windmills. The presence of new facilities would normally be accompanied by increased numbers of workers in the area, traffic on local roadways, and support facilities, all of which would add to cumulative visual impacts.

As many as 14 solar and 26 wind projects have authorized or pending applications on public lands within 50 mi (80 km) of the SEZ. While the overall extent of cumulative effects of renewable energy development in the area would depend on the number of projects that are actually built, it may be concluded that the general visual character of the landscape could be transformed from primarily rural desert to more commercial-industrial in nature as a consequence of these developments. Because of the topography of the region, solar facilities, located in flat basins, would be visible at great distances from sensitive viewing locations in the surrounding mountains. Also, the developments would be located near major roads, thus the facilities would be viewable by motorists. However, some portions of major roads where solar energy facilities would be located are currently visually affected by transmission line corridors, towns, and other infrastructure, as well as the road system itself.

In addition to cumulative visual impacts associated with views of particular future facilities, as additional facilities are added, several projects might become visible from one location or in succession as viewers move through the landscape, for example, as viewers drive on local roads. In general, the new facilities would likely vary in appearance, and depending on the number and type of facilities, the resulting visual disharmony could exceed the visual absorption capability of the landscape and add significantly to the cumulative visual impact. Thus, the overall cumulative visual impacts in the region from solar and wind energy development would be significant.

9.3.22.4.14 Acoustic Environment

The areas around the proposed Pisgah SEZ and in San Bernardino County, in general, are relatively quiet. The existing noise sources include road traffic, railroad traffic, aircraft flyovers, agricultural activities, industrial activities including mining, and activities and events at nearby communities. During construction of solar energy facilities, construction equipment could increase the noise levels over short durations during the day. After the facilities are constructed and begin operating, there would be little or minor noise impacts for any of the technologies, except from solar dish engine facilities and from parabolic trough or power tower facilities using TES. It is possible that residents could be cumulatively affected by more than one solar or other development built in close proximity to the SEZ, particularly at night when noise is more discernable due to relatively low background levels. However, such cumulative impacts are unlikely due to the expected wide separation of facilities and the sparse population of the region.

9.3.22.4.15 Paleontological Resources

The potential for impacts on significant paleontological resources at the Pisgah SEZ in the Mojave Valley is unknown. The specific sites selected for future projects would be surveyed if determined to be necessary by the BLM, and any paleontological resources encountered would be avoided or mitigated to the extent possible. A similar process would be employed at other facilities constructed in the area, and no significant cumulative impacts on paleontological resources are expected.

9.3.22.4.16 Cultural Resources

Direct impacts on significant cultural resources during site preparation and construction activities could occur in the proposed Pisgah SEZ. However, further investigation would be needed, including a cultural resource survey of the entire area of potential effects to identify historic properties (i.e., cultural resources eligible for listing in the NHRP). It is possible that the development of utility-scale solar energy projects in the Pisgah SEZ and other projects likely to occur in the area could contribute cumulatively to cultural resource impacts. However, historic properties would be avoided or mitigated to the extent possible, in accordance with state and federal regulations. Similarly, through ongoing consultation with the California SHPO and appropriate Native American governments, it is likely that many adverse effects on significant resources in the area could be mitigated to some degree, although some visual impacts may not be mitigable to the satisfaction of all interested parties. The increment of adverse effects from solar energy development on the overall cumulative effect on cultural resources would depend on the nature of the resources affected, and could be significant.

9.3.22.4.17 Native American Concerns

Government-to-government consultation has been initiated with federally recognized Tribes whose traditional use areas include the Pisgah SEZ area in order to identify Tribal concerns regarding solar energy development within the SEZ. Among the concerns expressed by the Tribes regarding solar energy development in the California deserts is the impairment of culturally and religiously important landscapes, including adverse impacts on culturally important native plant and game species. It is likely that the development of utility-scale solar energy projects within the SEZ, when added to other potential projects likely to occur in the area, including renewable energy projects outside the SEZ, would contribute cumulatively to visual impacts on their traditional landscape and the destruction of other resources in the valley important to Native Americans. The Pisgah SEZ vicinity has experienced past impacts from highways, transmission lines, and other infrastructure along I-40. Continued government-to-government consultation with the area Tribes is necessary to effectively consider and address the cumulative impacts of solar energy development in the Pisgah SEZ on resources important to the Tribes.

9.3.22.4.18 Socioeconomics

Solar energy development projects in the proposed Pisgah SEZ could cumulatively contribute to socioeconomic effects in the immediate vicinity of the SEZs and in the surrounding multicounty ROI. The effects could be positive (e.g., creation of jobs and generation of extra income, increased revenues to local governmental organizations through additional taxes paid by the developers and workers) or negative (e.g., added strain on social institutions such as schools, law enforcement agencies, and health care facilities). Impacts from solar development would be most intense during facility construction, but of greatest duration during operations. Construction in the Pisgah SEZ and at other new projects in the area, including other renewable energy development, would temporarily increase the number of workers in the area needing housing and services. The number of workers involved in the construction of solar projects in the proposed Pisgah SEZ alone could range from about 260 to 3,500 in the peak construction year, depending on the technology being employed, with solar PV facilities at the low end and solar trough facilities at the high end. The total number of jobs created in the area could range from approximately 800 (solar PV) to as high as 10,700 (solar trough).

Cumulative socioeconomic effects in the ROI from construction of solar facilities would occur to the extent that multiple construction projects of any type were ongoing simultaneously. It is a reasonable expectation that this condition would occur within a 50-mi (80-km) radius of the SEZ occasionally over the solar development period of 20 years or more. Anticipated projects with advanced proposals, including three fast-track solar projects, could place a modest short-term strain on local resources in this sparsely populated area during the period 2011 to 2013, when a number of projects might be constructed.

Annual impacts during the operation of solar facilities would be less, but could last 20 to 30 years and could combine with those from other new projects in the area. The number of workers needed at the solar facilities within the SEZ would be in the range of 40 to 840, with approximately 60 to 1,400 total jobs created in the region, depending on the solar technologies used. Population increases resulting from renewable energy development within 50 mi (80 km) of the proposed Pisgah SEZ would contribute to general population growth experienced in the region in recent years. The overall socioeconomic impacts would be positive, through the creation of additional jobs and income. The negative impacts, including some short-term disruption of rural community quality of life, would not be considered large enough to require SEZ-specific design features.

9.3.22.4.19 Environmental Justice

Solar development within the proposed Pisgah SEZ could have impacts on minority and low-income populations within 50 mi (80 km) of the proposed Pisgah SEZ in California; however, such impacts are expected to be small, mainly from dust emissions during construction and potentially noise from some solar technologies during the operation of solar facilities (Section 9.3.20.2). Such impacts, however, would not be expected to contribute to cumulative impacts on minority and low-income populations, as they are generally of short duration and range.

9.3.22.4.20 Transportation

During construction activities, there could be up to 1,000 workers commuting to a single construction site at the SEZ. I-40 and the National Trails Highway would experience small impacts for single projects that may have up to 1,000 daily workers, with an additional 2,000 vehicle trips per day (maximum). Such an increase is approximately 15% of the current traffic on I-40 near the SEZ and could have small cumulative impacts in combination with existing traffic levels and increases from additional future projects in the area. Should two large projects with approximately 1,000 daily workers each be under development simultaneously, cumulative impacts on I-40 and other local roads could be moderate.

Local road improvements may be necessary near site access points. Any impacts during construction activities would be temporary. The impacts could be mitigated to some degree by having different work hours for projects within the SEZ. Traffic increases during operation would be reduced because of the lower number of workers needed to operate solar facilities and would have a smaller contribution to cumulative impacts.

9.3.23 References

Note to Reader: This list of references identifies Web pages and associated URLs where reference data were obtained for the analyses presented in this PEIS. It is likely that at the time of publication of this PEIS, some of these Web pages may no longer be available or their URL addresses may have changed. The original information has been retained and is available through the Public Information Docket for this PEIS.

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9.4 RIVERSIDE EAST

9.4.1 Background and Summary of Impacts

9.4.1.1 General Information

The proposed Riverside East SEZ is the largest of the proposed SEZs in the six-state study area**,** with a total area of 202,896 acres (821 km^2). The SEZ spans a distance of about 45 mi (72 km) between the points farthest west and east, but it has an irregular shape with a large excluded central area (see Figure 9.4.1.1-1). The eastern boundary of the site is about 6 mi (10 km) west of the Arizona border. The western boundary abuts and surrounds a portion of Joshua Tree National Park. The nearest towns with populations greater than 10,000 are Blythe, located about 6 mi (10 km) southeast of the SEZ with a 2008 population of 21,727; and Indio, located about 45 mi (72 km) west of the SEZ on I-10, with a 2008 population of 84,443. The small town of Desert Center (2000 population of 150) is located at the far southwestern edge of the SEZ, along I-10.

The SEZ is located in Riverside County in southeastern California. In 2008, the county population was 84,443. The closest large cities are Moreno Valley, San Bernardino, and Riverside (all located slightly more than 100 mi [161 km] west of the SEZ on I-10. The Interstate runs east–west along the southern boundary of the SEZ. Other paved roads that cross parts of the Riverside East SEZ include State Route 177, which runs north–south through the western section of the SEZ, and Midland Road, which crosses the northeastern portion of the SEZ. U.S. 95 runs north–south about 3 mi (5 km) from the eastern boundary of the SEZ and through the town of Blythe.

The nearest operating railroad is the Arizona and California (ARZC) Railroad, which passes through Rice, about 18 mi (29 km) north of the large eastern section of the proposed Riverside East SEZ. The ARZC is a regional short line; the rail stop at Vidal is about a 41 mi (66 km) drive from the SEZ via U.S. 95. Eight small airports open to the public are within a driving distance of approximately 72 mi (116 km) of the SEZ.

An existing 500-kV transmission line runs east–west along I-10 and parallel to the southern SEZ boundary. It is assumed that the existing 500-kV transmission line could potentially provide access from the SEZ to the transmission grid (see Section 9.4.1.2). In addition, a 230-kV line passes through the far western section of the SEZ, and a 69-kV line passes through the eastern portion of the SEZ, along with other transmission lines (see Section 9.4.2).

As of February 2010, a total of 15 solar project applications were pending in the SEZ. The combined areas of these applications cover about 132,000 acres (534 km^2), about 65% of the SEZ area (see Figure 9.4.1.1-1). Of these active pending applications within the SEZ, three are fast-track applications for parabolic trough facilities and one is a fast-track application for a PV facility. The combined capacity for these four facilities, when built, would be about 2,300 MW.

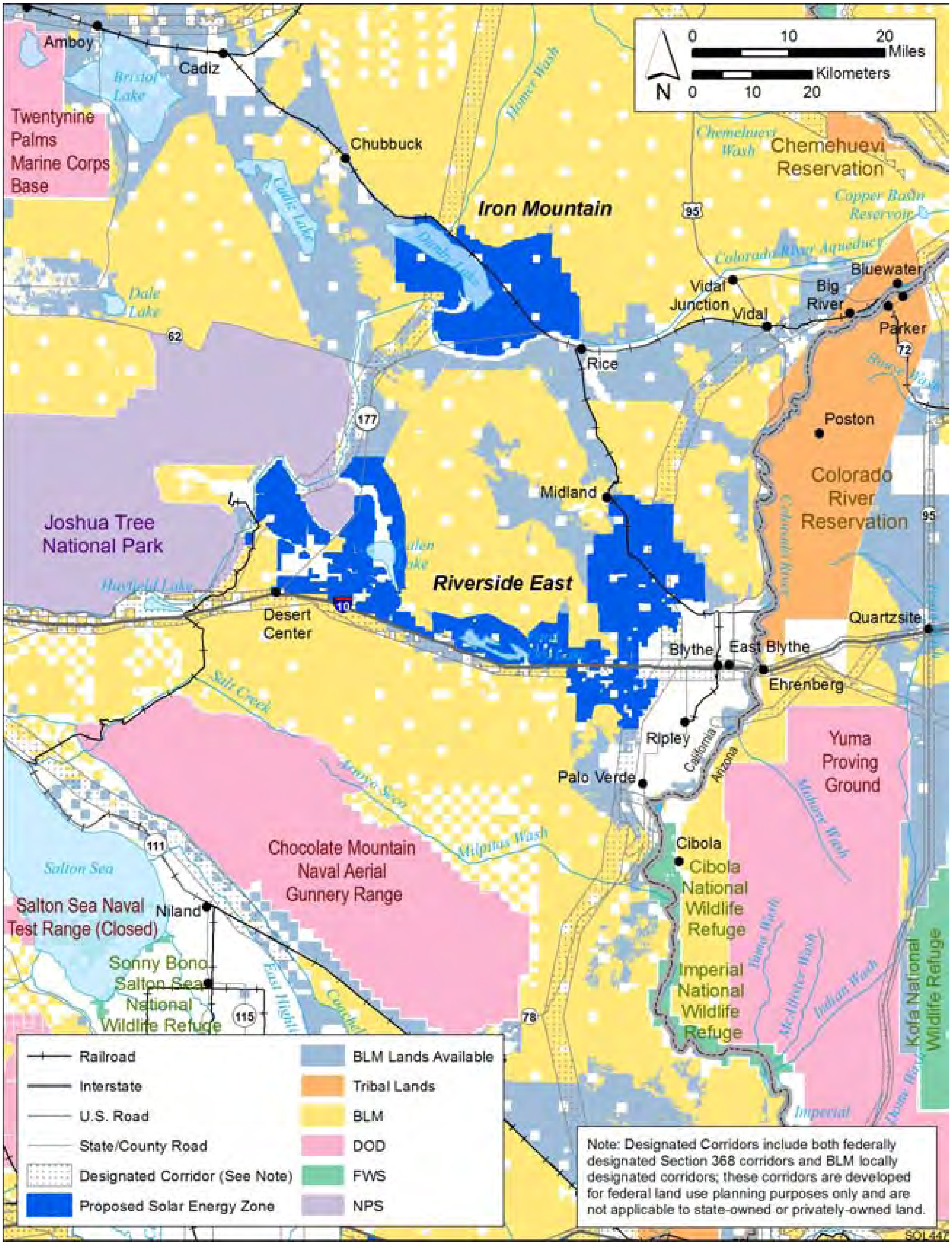

FIGURE 9.4.1.1-1 Proposed Riverside East SEZ

The proposed Riverside East SEZ and other relevant information are shown in Figure 9.4.1.1-1. The criteria used to identify the SEZ as an appropriate location for solar development included proximity to existing transmission lines or designated corridors, proximity to existing roads, a slope of generally less than 2%, and an area of more than 2,500 acres (10 km^2). In addition, the area was identified as being free of other types of conflicts, such as USFWS-designated critical habitat for threatened and endangered species, ACECs, SRMAs, and NLCS lands (see Section 2.2.2.2 for the complete list of exclusions). Although these classes of restricted lands were excluded from the proposed Riverside East SEZ, other restrictions might be appropriate. The analyses in the following sections address the affected environment and potential impacts associated with utility-scale solar energy development in the proposed SEZ for important environmental, cultural, and socioeconomic resources.

As initially announced in the *Federal Register* on June 30, 2009, the proposed Riverside East SEZ encompassed 202,295 acres (819 km^2). Subsequent to the study area scoping period, the Riverside East boundaries were altered somewhat to facilitate the BLM's administration of the SEZ area. Borders with irregularly shaped boundaries were adjusted to match the section boundaries of the PLSS (BLM and USFS 2010). Some small higher slope areas at the borders of the site were also added to the SEZ, but these higher slope areas would not likely be utilized for solar facilities. The revised SEZ is approximately 600 acres (2.4 km^2) larger than the original SEZ as published in June 2009.

9.4.1.2 Development Assumptions for the Impact Analysis

Maximum development of the proposed Riverside East SEZ was assumed to be 80% of the total SEZ area over a period of 20 years, a maximum of 162,317 acres (657 km^2). These values are shown in Table 9.4.1.2-1, along with other development assumptions. Full development of the Riverside East SEZ would allow development of facilities with an estimated total of 18,035 MW of electrical power capacity if power tower, dish engine, or PV technologies were used, assuming 9 acres/MW (0.04 km^2/MW) of land required, and an estimated 32,463 MW of power if solar trough technologies were used, assuming 5 acres/MW (0.02 km^2/MW) of land required.

Availability of transmission from SEZs to load centers will be an important consideration for future development in SEZs. The nearest existing transmission line is a 500-kV line that runs through the SEZ. It is possible that this existing line could be used to provide access from the SEZ to the transmission grid, but the 500-kV capacity of that line would be inadequate for 18,035 to 32,463 MW of new capacity (note that a 500-kV line can accommodate approximately the load of one 700 MW facility). At full build-out capacity, it is clear that substantial new transmission and/or upgrades of existing transmission lines would be required to bring electricity from the proposed Riverside East SEZ to load centers; however, at this time the location and size of such new transmission facilities are unknown. Generic impacts of transmission and associated infrastructure construction and of line upgrades for various resources are discussed in Chapter 5. Project-specific analyses would need to identify the specific impacts of new transmission construction and line upgrades for any projects proposed within the SEZ.

TABLE 9.4.1.2-1 Proposed Riverside East Development Acreages, Maximum Solar Megawatt Output, Access Roads, and Transmission Line ROWs

Total Acreage and Assumed Developed Acreage (80% of Total)	Assumed Maximum SEZ Output for Various Solar Technologies	Distance to Nearest State, U.S. or Interstate Highway	Distance and Capacity of Nearest Existing Transmission Line	Assumed Area of Transmission Line ROW and Road ROW	Distance to Nearest Designated Transmission Corridor[d]
202,896 acres and 162,317 acres[a]	18,035 MW[b] 32,463 MW[c]	Adjacent (I-10)	Adjacent to SEZ, and 500 kV	0 acres and 0 acres	Adjacent to SEZ[e]

[a] To convert acres to km^2, multiply by 0.004047.

[b] Maximum power output if the SEZ were fully developed using power tower, dish engine, or PV technologies, assuming 9 acres/MW (0.04 km^2/MW) of land required.

[c] Maximum power output if the SEZ were fully developed using solar trough technologies, assuming 5 acres/MW (0.02 km^2/MW) of land required.

[d] BLM-designated corridors are developed for federal land use planning purposes only and are not applicable to state-owned or privately owned land.

[e] A Section 368 federally designated 2-mi (3-km) wide energy corridor runs adjacent to the south boundary of the SEZ.

For the purposes of analysis in this PEIS, it was assumed that the existing 500-kV transmission line that runs east–west along I-10 and parallel to the southern SEZ boundary could provide access to the transmission grid, and thus no additional acreage disturbance for transmission line access was assessed. In addition, a 230-kV line passes through the far western section of the SEZ, and a 69-kV line passes through the eastern portion of the SEZ. Access to the existing transmission lines was assumed, without additional information on whether these lines would be available for connection of future solar facilities. If a connecting transmission line were constructed in the future to a different off-site grid location from the one assumed here, site developers would need to determine the impacts from construction and operation of that line. Additionally, developers would need to determine the impacts of line upgrades if they are needed.

Existing road access to the proposed Riverside East SEZ should be adequate to support construction and operation of solar facilities, because I-10 passes along the southern edge of the SEZ and there are several exits from I-10 as it passes by and through the SEZ. Because of the site access provided by I-10, no additional road construction outside of the SEZ is assumed to be required to support solar development of the SEZ.

9.4.1.3 Summary of Major Impacts and SEZ-Specific Design Features

In this section, the impacts and SEZ-specific design features assessed in Sections 9.4.2 through 9.4.21 for the proposed Riverside East SEZ are summarized in tabular form. Table 9.4.1.3-1 is comprehensive list of the impacts identified in these sections; the reader may reference the applicable sections for detailed support of the impact assessment. Section 9.4.22 discusses potential cumulative impacts from solar energy development in the proposed SEZ.

Only those design features specific to the proposed Riverside East SEZ are included in Sections 9.4.2 through 9.4.21 and in the summary table. The detailed programmatic design features for each resource area to be required under BLM's proposed Solar Energy Program are presented in Appendix A, Section A.2.2. These programmatic design features would also be required for development in this and the other SEZs.

TABLE 9.4.1.3-1 Summary of Impacts of Solar Energy Development within the Proposed Riverside East SEZ and SEZ-Specific Design Features[a]

Resource Area	Environmental Impacts—Proposed Riverside East SEZ	SEZ-Specific Design Features
Lands and Realty	Full development of the SEZ for utility-scale solar energy production (80% of the total area) could disturb up to 162,317 acres (657 km^2) and would establish a very large and continuous industrial area along the 45-mi (72-km) stretch of I-10 that would exclude many existing and potential uses of the land, perhaps in perpetuity. Since much of the SEZ is undeveloped and rural, utility-scale solar energy development would introduce a new and discordant land use to the area.	None.
	Solar development along the I-10 corridor, State Route 177, and Midland Road would be highly visible to the public traveling these routes. In addition, solar development in the western portion of the SEZ along State Route 177 and County Road 2 would likely create conflict with existing residential use near Desert Center, Lake Tamarisk Resort, and scattered private residences, including those associated with agricultural development.	None.
	It is possible that the 11,640 acres (47 km^2) of private and state lands located within the external boundary of the SEZ eventually would be developed in the same or a complementary manner as the public lands.	None.
	15,683 acres (63 km^2) of the Section 368 energy corridor overlaps with the proposed SEZ. Two other BLM corridors oriented principally north and south designated in the CDCA Plan also overlap the SEZ. Because of technical constraints, solar development could not occur within a transmission ROW. Thus it appears that either the transmission corridors would have to be modified/reduced or solar development would have to be precluded within the transmission corridor.	None.

TABLE 9.4.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Riverside East SEZ	SEZ-Specific Design Features
Specially Designated Areas and Lands with Wilderness Characteristics	SEZ development would adversely affect wilderness characteristics in the Palen-McCoy, Rice Valley, Big Maria Mountains, Chuckwalla Mountains, and Little Chuckwalla Mountains WAs and in Joshua Tree NP.	Application of SEZ-specific design features for visual resource impacts may reduce the visual impact on wilderness characteristics
	Solar facility development could adversely affect the scenic view from Joshua Tree National Park, the natural soundscape, and the quality of the night sky environment as viewed from the NP and wilderness areas in the region.	None.
	There is potential for adverse impacts on resources within the seven ACECs in and near the SEZ.	Once construction of solar energy facilities begins, the BLM would monitor resource conditions in the seven ACECs to determine whether additional design features would be required to protect the resources in these areas.
Rangeland Resources: Livestock Grazing	None.	None.
Rangeland Resources: Wild Horses and Burros	None.	None.
Recreation	Recreational users would lose the use of any portions of the SEZ developed for solar energy production, but the amount of recreation that is lost is expected to be small. Roads and trails through areas developed for solar power production could be closed or rerouted, although existing county roads would continue to provide general access where they exist.	None.
	The Midland LTVA is located within the SEZ, and solar development could occur very close to the LTVA. The impact of solar energy development on the use of the LTVA by winter visitors is not known, but it is likely the combination of increased traffic and development could discourage some of this use.	A buffer between the Midland LTVA and solar development should be established to preserve the LTVA area. The size of the buffer should be determined based on the site- and visitor-specific criteria.

TABLE 9.4.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Riverside East SEZ	SEZ-Specific Design Features
Recreation *(Cont.)*	A large-scale change in the overall character of the SEZ would accompany intensive solar development and would discourage recreational use in areas adjacent to the SEZ, including designated wilderness, undesignated lands, and Joshua Tree NP. The potential loss of recreation use is not known.	None.
Military and Civilian Aviation	The development of any solar energy or transmission facilities that encroach into the airspace of MTRs could conflict with military training activities and could create a safety concern.	None.
	Two public airports are located within or in near proximity of the SEZ and could be affected by solar energy development.	Coordination with the FAA and local airport authorities should be required early in the project planning process to identify and mitigate potential impacts on the local airports. Precautions should be taken for pilots to avoid interference with flight paths or related flight operations, and to avoid reflector glare hazards and thermal plumes.
Geologic Setting and Soil Resources	Impacts on soil resources would occur as a result of ground-disturbing activities (e.g., grading, excavating, and drilling) during the construction phase. Impacts include soil compaction, soil horizon mixing, soil erosion and deposition by wind, soil erosion by water and surface runoff, sedimentation, and soil contamination. These may be impacting factors for other resources (e.g., air quality, water quality, and vegetation). Palen and Ford Dry Lakes may not be suitable locations for construction.	None.
Minerals (fluids, solids, and geothermal resources)	None.	None.

TABLE 9.4.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Riverside East SEZ	SEZ-Specific Design Features
Water Resources	Ground-disturbance activities (affecting 4% of the total area in the peak construction year) could affect surface water quality due to surface runoff, sediment erosion, and contaminant spills. Construction activities may require up to 6,813 ac-ft (8.4 million m^3) of water during peak construction year. Construction activities could generate up to 222 ac-ft (273,800 m^3) of sanitary wastewater. Assuming full development of the SEZ, normal operations would use the following amounts of water: • For parabolic trough facilities (32,463-MW capacity), 23,180 to 49,150 ac-ft/yr (28.6 million to 60.6 million m^3/yr) for dry-cooled systems (wet cooling not feasible with respect to water requirements); • For power tower facilities (18,035-MW capacity), 12,827 to 27,255 ac-ft/yr (15.8 million to 33.6 million m^3/yr) for dry-cooled systems (wet cooling not feasible with respect to water requirements); • For dish engine facilities (18,035-MW capacity), 9,220 ac-ft/yr (11.4 million m^3/yr). • For PV facilities (18,035-MW capacity), 922 ac-ft/yr (1.1 million m^3/ yr). Assuming full development of the SEZ, normal operations would generate up to 455 ac-ft/yr (561,200 m^3/yr) of sanitary wastewater and up to 9,222 ac-ft (11.4 million m^3/yr) of blowdown water.	Wet-cooling options would not be feasible; other technologies should incorporate water conservation measures. Land disturbance activities should avoid impacts to the extent possible near the regions surrounding Palen Lake, Ford Dry Lake, and McCoy Wash. During site characterization, hydrologic investigations would need to identify 100-year floodplains and potential jurisdictional water bodies subject to Clean Water Act Section 404 permitting. Siting of solar facilities and construction activities should avoid areas identified as within a 100-year floodplain. During site characterization, coordination and permitting with CDFG regarding California's Lake and Streambed Alteration Program would be required for any proposed alterations to surface water features (both perennial and ephemeral). Groundwater withdrawals should comply with rules and regulations set forth by the PVID for the portions of the SEZ located within PVID boundaries. The use of groundwater in the Chuckwalla Valley and Palo Verde Mesa should be planned for and monitored in cooperation with the BOR and the USGS in reference to the Colorado River Accounting Surface and the rules set forth in the Law of the River.

TABLE 9.4.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Riverside East SEZ	SEZ-Specific Design Features
Water Resources *(Cont.)*	High TDS values of groundwater could produce water that is non-potable and corrosive to infrastructure.	Groundwater monitoring and production wells should be constructed in accordance with standards set forth by the State of California and Riverside County. Stormwater management plans and BMPs should comply with standards developed by the California Stormwater Quality Association. Water for potable uses would have to meet or be treated to meet water quality standards of the California Safe Drinking Water Act.
Vegetation[b]	Up to 80% (162,317 acres [657 km^2]) of the SEZ would be cleared of vegetation. Re-establishment of desert scrub or other communities in temporarily disturbed areas would likely be very difficult because of the arid conditions and might require extended periods of time. Noxious weeds could become established in disturbed areas and colonize adjacent undisturbed habitats, thus reducing restoration success and potentially resulting in widespread habitat degradation. The deposition of fugitive dust from disturbed soil areas in habitats outside a solar project area could result in reduced productivity or changes in plant community composition.	An Integrated Vegetation Management Plan, addressing invasive species control, and an Ecological Resources Mitigation and Monitoring Plan, addressing habitat restoration and management, should be approved and implemented to increase the potential for successful restoration of creosotebush-white bursage desert scrub communities and other affected habitats and minimize the potential for the spread of tamarisk, Sahara mustard, cheatgrass, or other invasive species. Invasive species control should focus on biological and mechanical methods where possible to reduce the use of herbicides.
	Approximately 3,807 acres (15.4 km^2) of wetland habitat occurs within the SEZ and could be adversely affected by project development. Groundwater withdrawals could reduce groundwater discharge along riparian areas, and such reductions at springs and seeps that support riparian habitats could result in degradation of these habitats.	All wetland, riparian, playa, dry wash (including dry wash microphyll woodland), sand dune and sand transport areas, and chenopod scrub habitats within the SEZ should be avoided to the extent practicable, and any impacts minimized and mitigated. A buffer area should be maintained around wetland, riparian, playa, and dry wash communities to reduce the potential for impacts on these communities on or near the SEZ.

TABLE 9.4.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Riverside East SEZ	SEZ-Specific Design Features
Vegetation[b] *(Cont.)*		Appropriate engineering controls should be used to minimize impacts on wetland, riparian, playa, dry wash woodland, and chenopod scrub, including downstream occurrences, resulting from surface-water runoff, erosion, sedimentation, altered hydrology, accidental spills, or fugitive dust deposition to these habitats. Appropriate buffers and engineering controls would be determined through agency consultation. Groundwater withdrawals should be limited to reduce the potential for indirect impacts on riparian habitat associated with groundwater discharge or groundwater-dependent communities, such as mesquite bosque or bush seep-weed communities.
Wildlife: Amphibians and Reptiles[b]	The red-spotted toad and Couch's spadefoot are the main amphibian species expected to occur within the Riverside East SEZ. Several other amphibian species could inhabit the Colorado River Aqueduct west of the SEZ. These species, which include the bullfrog, Colorado River toad, Rio Grande leopard frog, and Woodhouse's toad, would not be expected to occur within the SEZ. Thirty-one reptile species (the desert tortoise, which is a federally and state-listed species, 13 lizards, and 17 snakes) could occur within the SEZ. Direct impacts on these species from SEZ development would be moderate (3.5 to 5.9% of potentially suitable habitats identified for the species in the SEZ region would be lost). With implementation of programmatic design features, indirect impacts would be expected to be negligible.	To the extent practicable, avoid ephemeral drainages, Palen Lake and Ford Dry Lake, and wetlands. The potential for indirect impacts on several amphibian species could be reduced by maximizing the distance between solar energy development and the Colorado River Aqueduct.

TABLE 9.4.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Riverside East SEZ	SEZ-Specific Design Features
Wildlife: Birds[b]	More than 100 species of birds have a range that encompasses the Riverside East SEZ region. However, habitats for about 40 of these species either do not occur on or are limited within the SEZ (e.g., habitat for waterfowl and wading birds). Direct impacts from habitat disturbance and long-term habitat reduction/fragmentation would be small to moderate (0.3 to 5.5% of potentially suitable habitats identified for the species in the SEZ region would be lost). Other impacts on birds could result from collision with vehicles and facility structures, surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, noise, lighting, spread of invasive species, accidental spills, and harassment. Indirect impacts on areas outside the SEZ (e.g., impacts caused by dust generation, erosion, and sedimentation) are expected to be negligible with implementation of proposed design features.	Pre-disturbance surveys should be conducted within the SEZ for desert bird focal species and bird species listed under the Migratory Bird Treaty Act. Impacts on potential nesting habitat for these species should be avoided during the nesting season. Plant species that positively influence the presence and abundance of the desert bird focal species should be avoided to the extent practicable. These species include Goodding's willow, yucca, Joshua tree, mesquite, honey mesquite, screwbean, desert mistletoe, big saltbush, smoketree, and catclaw acacia. Take of golden eagles and other raptors should be avoided. Mitigation regarding the golden eagle should be developed in consultation with the USFWS and CDFG. A permit may be required under the Bald and Golden Eagle Protection Act. To the extent practicable, ephemeral drainages, Ford Dry Lake and Palen Lake, wetlands, and the CRA should be avoided.
Wildlife: Mammals[b]	Direct impacts on cougar, mule deer, small game, furbearers, and small mammals on the SEZ from habitat disturbance and long-term habitat reduction/fragmentation would be moderate (3.3 to 7.2% of potentially suitable habitats identified for the species in the SEZ region would be lost).	The fencing around the solar energy development should not block the free passage of mule deer between the Colorado River and mountains or foothills.

TABLE 9.4.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Riverside East SEZ	SEZ-Specific Design Features
Wildlife: Mammals[b] *(Cont.)*	Although the Riverside East SEZ falls within the overall range of the cougar, desert habitat is not the preferred habitat for the species. It is unlikely that impacts from solar energy development within the SEZ would represent an actual loss of occupied habitat. Mule deer could occur within the desert scrub and desert wash habitats of the SEZ for portions of the year, particularly when standing water occurs in Ford Dry Lake and Palen Lake. Fencing around a large solar development within the SEZ could affect movement of mule deer between the Colorado River and mountains or foothills. Other impacts on mammals could result from collision with vehicles and fences, surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, noise, lighting, spread of invasive species, accidental spills, and harassment. Indirect impacts on areas outside the SEZ (e.g., impacts caused by dust generation, erosion, and sedimentation) are expected to be negligible with implementation of proposed design features.	To the extent practicable, ephemeral drainages, Ford Dry Lake and Palen Lake, wetlands, and the Colorado River Aqueduct should be avoided.
Aquatic Biota[b]	No permanent water bodies or streams are present within the boundaries of the Riverside East SEZ. Within the SEZ and the area of potential indirect effects, aquatic biota, if present in Palen Lake, Ford Dry Lake, and wetlands, could be affected by ground disturbance, contaminants inputs, and soil deposition from runoff and fugitive dust.	Ground disturbance near McCoy Wash, Palen Lake, Ford Dry Lake and wetlands should be avoided or minimized to the extent practicable.
	About 31 mi (50 km) of the Colorado River Aqueduct is present primarily along the western edge of the SEZ. Aquatic organisms present in this feature could be affected by airborne particulate deposition originating from the SEZ especially for ground disturbance occurring along the western boundary of the SEZ.	None.

TABLE 9.4.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Riverside East SEZ	SEZ-Specific Design Features
Special Status Species[b]	Potentially suitable habitat for 69 special status species occurs in the affected area of the Riverside East SEZ. For most of these special status species, between 1% and 10% of the potentially suitable habitat in the region occurs in the area of direct effects; for several dune-obligate species, up to 32% of the potentially suitable habitat in the region occurs in the area of direct effects.	Pre-disturbance surveys should be conducted within the SEZ to determine the presence and abundance of special status species. Disturbance to occupied habitats for these species should be avoided or minimized to the extent practicable. If avoiding or minimizing impacts to occupied habitats is not possible for some species, translocation of individuals from areas of direct effect; or compensatory mitigation of direct effects on occupied habitats could reduce impacts. A comprehensive mitigation strategy for special status species that used one or more of these options to offset the impacts of development should be developed in coordination with the appropriate federal and state agencies. Disturbance of desert playa and wash habitats within the SEZ should be avoided or minimized to the extent practicable. In particular, development should be avoided in and near Ford Dry Lake, Palen Lake, and McCoy Wash within the SEZ. Avoiding or minimizing disturbance of these habitats could reduce impacts on 9 special status species. Avoiding or minimizing disturbance of sand dunes and sand transport systems, woodlands, rocky cliffs, and outcrops on the SEZ could reduce impacts on 20 special status species. Consultations with the USFWS and the CDFG should be conducted to address the potential for impacts on the desert tortoise a species listed as

TABLE 9.4.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Riverside East SEZ	SEZ-Specific Design Features
Special Status Species[b] *(Cont.)*		threatened under the ESA and CESA. Consultation would identify an appropriate survey protocol, avoidance measures, and, if appropriate, reasonable and prudent alternatives, reasonable and prudent measures, and terms and conditions for incidental take statements. Harassment or disturbance of special status species and their habitats in the affected area should be mitigated by identifying any additional sensitive areas and implementing necessary protection measures based upon consultation with the USFWS and CDFG.
Air Quality and Climate	*Construction*: Temporary exceedances of AAQS for PM_{10} and $PM_{2.5}$ at the SEZ boundaries; higher concentrations would be limited to the immediate area surrounding the SEZ boundary and would decrease quickly with distance. For construction occurring in the west-central portion of the SEZ, fugitive dust emissions could result in considerable impacts at the nearest federal Class I area (Joshua Tree NP). (Conservative assumptions e.g., three simultaneous construction projects occurring in close proximity to the Joshua Tree NP resulted in these estimates). Engine exhaust of heavy equipment and vehicles could cause some impacts on air-quality-related values (e.g., visibility and acid deposition) at the nearest federal Class I area. NO_x emissions from engine exhaust would be the primary contributors to potential impacts on AQRVs.	None.

TABLE 9.4.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Riverside East SEZ	SEZ-Specific Design Features
Air Quality and Climate *(Cont.)*	*Operations*: Positive impact due to avoided emission of air pollutants from combustion-related power generation: 30 to 54% of total emissions of SO_2, NO_x, Hg, and CO_2 from electric power systems in the state of California avoided (up to 7,272 tons/yr SO_2, 11,944 tons/yr NO_x, 0.11 ton/yr Hg, and 28,258,000 tons/yr CO_2).	
Visual Resources	Large visual impacts on the SEZ and surrounding lands within the SEZ viewshed due to major modification of the character of the existing landscape; potential additional impacts from construction and operation of transmission lines and access roads within the SEZ. Residents, workers, and visitors to the area may experience visual impacts from solar energy facilities located within the SEZ (as well as any associated access roads and transmission lines) as they travel area roads. Nearby residents could be subjected to large visual impacts from solar energy development within the SEZ.	Within the SEZ, in areas west of the northwest corner of Section 6 of Township 006S Range 017E, and in areas north and west of the northwest corner of Section 30 of Township 005S Range 018E, visual impacts associated with solar energy development in the SEZ should be consistent with VRM Class II management objectives, as determined from KOPs to be selected by the BLM within Joshua Tree NP and the Palen-McCoy WA.
	The SEZ is located within the CDCA. While renewable energy development is allowable within the SEZ under the CDCA management plan, substantial, immitigable visual impacts will occur within the CDCA in the SEZ and surrounding lands. The SEZ is adjacent to Joshua Tree NP and Joshua Tree WA. Because of the open views of the SEZ and/or elevated viewpoints, strong visual contrasts could be observed by NP and WA visitors. The SEZ is adjacent to the Big Maria Mountains WA. Because of the open views of the SEZ and/or elevated viewpoints, strong visual contrasts could be observed by WA visitors. The SEZ is located 1.1 mi (1.8 km) from the Chuckwalla Mountains WA. Because of the open views of the SEZ and elevated viewpoints, weak to strong visual contrasts could be observed by WA visitors.	Within the SEZ, in areas visible from and within 3 mi (4.8 km) of the Rice Valley or Big Maria Mountains WSAs, visual impacts associated with solar energy project operation should be consistent with VRM Class II management objectives, as experienced from KOPs (to be determined by the BLM) within the WSAs, and in areas visible from between 3 and 5 mi (4.8 and 8.0 km); visual impacts should be consistent with VRM Class III management objectives.

TABLE 9.4.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Riverside East SEZ	SEZ-Specific Design Features
Visual Resources *(Cont.)*	The SEZ is located 5 mi (8 km) from the Little Chuckwalla Mountains WA. Because of the open views of the SEZ and elevated viewpoints, moderate to strong visual contrasts could be observed by WA visitors. The SEZ is adjacent to the Palen-McCoy WA. Because of the open views of the SEZ and/or elevated viewpoints, weak to strong visual contrasts could be observed by WA visitors. The SEZ is located 6 mi (10 km) from the Palo Verde Mountains WA. Because of the open views of the SEZ and elevated viewpoints, weak to moderate visual contrasts could be observed by WA visitors. The SEZ is located 0.5 mi (0.8 km) from the Rice Valley WA. Because of the open views of the SEZ and elevated viewpoints, strong visual contrasts could be observed by WA visitors. The SEZ is located 5 mi (8 km) from the Corn Springs Scenic ACEC. Because of the open views of the SEZ and elevated viewpoints, strong visual contrasts could be observed by ACEC visitors. Approximately 23 mi (37.0 km) of the Bradshaw Trail BLM Backcountry Byway is within the SEZ viewshed. Weak to strong visual contrasts could be observed within and near the SEZ by travelers on the Bradshaw Trail. Approximately 79 mi (127 km) of I-10 is within the SEZ viewshed. Six mi (10 km) of I-10 is within or abuts the SEZ. An additional 34 mi (55 m) is within 0.67 mi (1.1 km). Strong visual contrasts could be observed within and near the SEZ by travelers on I-10. Approximately 27 mi (43 m) of State Route 177 is within the SEZ viewshed. Eight mi (13 km) of State Route 177 is within the SEZ. Strong visual contrasts could be observed within and near the SEZ by travelers on State Route 177.	

TABLE 9.4.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Riverside East SEZ	SEZ-Specific Design Features
Visual Resources *(Cont.)*	The communities of Blythe, East Blythe, Ehrenberg, Palo Verde, Ripley, Cibola (Arizona), and Desert Center (including the Lake Tamarisk development) are located within the viewshed of the SEZ, although slight variations in topography and vegetation provide some screening. Strong visual contrasts may be observed within Desert Center and Lake Tamarisk. Moderate to strong visual contrasts may be observed within Blythe, East Blythe, and Ripley. Weak to moderate visual contrasts may be observed within Ehrenberg and Palo Verde.	
Acoustic Environment	*Construction*. Estimated noise levels at the nearest residences located just next to the west-central SEZ boundary would be about 74 dBA L_{eq}, which is higher than Riverside County regulation of 45 dBA daytime L_{eq} For a 10-hour daytime work schedule, 70 dBA L_{dn} at the nearest residences would be well above the EPA guideline of 55 dBA L_{dn} for residential areas. *Operations*. Noise levels at the nearest residences from a CSP solar facility would be 51 dBA L_{eq}, which is higher than the Riverside County standard of 45 dBA daytime L_{eq}. For 12-hour daytime operations, the estimated 49 dBA L_{dn} falls below the EPA guideline of 55 dBA L_{dn} for residential areas. However, for facilities with 6-hour TES, the estimated nighttime sound level at the nearest residences would be 61 dBA L_{eq}, which is higher than the Riverside County standard of 45 dBA daytime L_{eq}. The day-night average level is estimated to be about 63 dBA L_{dn}, which is higher than the EPA guideline of 55 dBA L_{dn} for residential areas. If 80% of the SEZ were developed with dish engine facilities, the estimated noise level of 59 dBA L_{eq} at the nearby residence would be higher than the Riverside County regulation of 45 dBA daytime $L_{eq.}$ For 12-hour daytime operations, the estimated 56 dBA L_{dn} at the nearby residence would be a little higher than the EPA guideline of 55 dBA L_{dn} for residential areas.	Noise levels from cooling systems equipped with TES should be managed so that levels at the nearby residences to the west and to the east of the SEZ are kept within applicable guidelines. This could be accomplished in several ways, for example, through placing the power block approximately 1 to 2 mi (1.6 to 3 km) or more from residences, limiting operations to a few hours after sunset, and/or installing fan silencers. Dish engine facilities within the Riverside East SEZ should be located more than 1 to 2 mi (1.6 to 3 km) from the nearby residences to the west and the east of the SEZ (i.e., the facilities should be located in other portions of the proposed SEZ). Direct noise control measures applied to individual dish engine systems could also be used to reduce noise impacts at the nearest residences.

TABLE 9.4.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Riverside East SEZ	SEZ-Specific Design Features
Paleontological Resources	The potential for impacts on significant paleontological resources at the SEZ is relatively unknown, but could be high in some areas. A more detailed investigation of the local geological deposits of the SEZ and their potential depth is needed; a paleontological survey would likely be required prior to project approval.	The need for and the nature of any SEZ-specific design features would depend on findings of paleontological surveys.
Cultural Resources	Direct impacts on significant cultural resources could occur in the proposed Riverside East SEZ; however, a cultural resource survey of the entire area of potential effect of a proposed project would first need to be conducted to identify archaeological sites, historic structures and features, and traditional cultural properties, and an evaluation would then be needed to determine whether any are eligible for listing in the NRHP. Numerous prehistoric and Native American sites and trails are potentially located within the SEZ and could be affected by solar energy development. Potential impacts on locations in the area that are of cultural or religious significance to Native American Tribes must also be evaluated. Activities associated with the WWII DDTC were also prominent in the valley, and physical remnants of those activities are present within the SEZ and could be affected.	Significant resources clustered in specific areas, such as those in the vicinity of Palen and Ford Dry Lakes, focused DTC/C-AMA activity areas that retain sufficient integrity, and Native American trails evident in the desert pavement should be avoided. Troops in training for World War II often used the same locations that Native Americans did for similar purposes. Any excavation of historic sites should take into consideration the potential for the co-location of prehistoric and ethnohistoric components. Other possible design features specific to the SEZ would be determined through consultation with the California SHPO and affected Tribes.
Native American Concerns	Concerns have been expressed in the past over the Salt Song Trail, which passes down Palen Valley and through the Riverside East SEZ. Solar development within the SEZ is likely to be visible from the trail. Additional trail networks also go through or near the SEZ. Additional features of potential concern include Big Maria, Coxcomb, and Eagle Mountains, Alligator Rock, Black Rock, and McCoy Springs.	The need for and nature of SEZ-specific design features would be determined during government-to-government consultation with the affected Tribes.

TABLE 9.4.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Riverside East SEZ	SEZ-Specific Design Features
Native American Concerns *(Cont.)*	As consultations continue, it is possible that other Native American concerns, regarding solar energy development within the SEZ will emerge. The Soboba Band of Luiseno Indians and the Quechan have expressed concerns over highly sensitive areas within their Tribal Traditional Use Areas.	
Socioeconomics	*Construction:* 1,181 to 15,633 total jobs; $70 million to $927 million income in ROI. *Operations:* 498 to 11,670 annual total jobs; $17 million to $424 million annual income in the ROI.	None.
Environmental Justice	There are both minority populations and low-income populations, as defined by CEQ guidelines, within the 50-mi (80-km) radius around the boundary of the SEZ, meaning that any adverse impacts of solar projects could disproportionately affect minority and low-income populations.	None.
Transportation	The primary transportation impacts would result from commuting worker traffic. I-10 provides a regional traffic corridor that would experience small impacts for single projects that may have up to 1,000 daily workers, with an additional 2,000 vehicle trips per day (maximum). Such an increase is less than 10% of the current traffic on I-10. However, the exits on I-10 might experience moderate impacts with some congestion. Should up to three large projects with approximately 1,000 daily workers each be under development simultaneously, an additional 6,000 vehicle trips per day could be added to I-10 in the vicinity of the SEZ, which is about a 25% increase in the current average daily traffic level on most segments of I-10 near the SEZ.	None.

TABLE 9.4.1.3-1 (Cont.)

Resource Area	Environmental Impacts—Proposed Riverside East SEZ	SEZ-Specific Design Features
Transportation *(Cont.)*	Because of the proximity of the Blythe and Desert Center Airports, without proper planning, there could be problems with reflector glare from the SEZ interfering with pilot vision during takeoffs and landings.	None.

Abbreviations: AAQS = ambient air quality standards; ACEC = Area of Critical Environmental Concern; BLM = Bureau of Land Management; BMP = best management practice; BOR = U.S. Bureau of Reclamation; CDCA = California Desert Conservation Area; CDFG = California Department of Fish and Game; CEQ = Council on Environmental Quality; CESA= California Endangered Species Act; CO_2 = carbon dioxide; dBA = A-weighted decibel; DoD = U.S. Department of Defense; DTC = Desert Training Center; EPA = U.S. Environmental Protection Agency; ESA = Endangered Species Act; FAA = Federal Aviation Administration; Hg = mercury; KOP = key observation point; L_{dn} = day-night average sound level; L_{eq} = equivalent continuous sound level; LTVA = long term visitor area; MTR = military training route; NO_x = nitrogen oxides; NP = National Park; NRHP = *National Register of Historic Places*; $PM_{2.5}$ = particulate matter with an aerodynamic diameter of 2.5 μm or less; PM_{10} = particulate matter with an aerodynamic diameter of 10 μm or less; PSD = prevention of significant deterioration;; PVID = Palo Verde Irrigation District; ROI = region of influence; SEZ = solar energy zone; SHPO = State Historic Preservation Office; SO_2 = sulfur dioxide; TDS = total dissolved solids; TES = thermal energy storage; USFWS = U.S. Fish and Wildlife Service; VRM = visual resource management; WA = Wilderness Area; WSA = Wilderness Study Area; WWII = World War II.

[a] The detailed programmatic design features for each resource area to be required under BLM's proposed Solar Energy Program are presented in Appendix A, Section A.2.2. These programmatic design features would be required for development in the proposed Riverside East SEZ.

[b] The scientific names of all plants, wildlife, aquatic biota, and special status species are provided in Sections 9.4.10 through 9.4.12.

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9.4.2 Lands and Realty

9.4.2.1 Affected Environment

The proposed Riverside East SEZ, at approximately 203,000 acres (821 km^2), is by far the largest of the SEZs being considered in this PEIS. It stretches for about 45 mi (72 km) east to west and measures about 25 mi (40 km) north to south. The towns of Blythe and Desert Center mark the approximate eastern and western limits of the SEZ. The western border of the SEZ lies close to much of the eastern border of Joshua Tree NP. The SEZ is located along a critical east–west corridor that contains I-10, numerous pipelines, and transmission lines and surrounds a portion of the Los Angeles Metropolitan Water District (MWD) Colorado River Aqueduct (CRA). Most of the pipelines are south of I-10 and outside of the SEZ, with the exception of the parcel south of I-10 on the eastern side of the SEZ. Five large transmission lines plus one more under construction pass through portions of the SEZ, primarily in the southeast and west (BLM 2009c, 2010a). State Route 177 passes through the west side of the SEZ in a northeasterly direction, and the Midland-Rice Road and a railroad pass through the eastern portion of the SEZ in a northwesterly direction.

In spite of this activity, most of the BLM-administered lands, especially those north of I-10 in the east, those between I-10 and the Palen-McCoy Mountains in the central part of the SEZ, and those on the west side of the Palen-McCoy Mountains and around Palen Lake, retain an undeveloped character. BLM lands in the western portion of the SEZ near I-10 and Desert Center and northwest of State Route 177 are also largely undeveloped, but the presence of developed private land including some residences, the state highway, extensive MWD facilities, a small airport, and the inactive Kaiser Mine and related facilities give the area a more developed setting.

Although the SEZ contains only BLM-administered land, numerous parcels of private land totaling about 11,000 acres (45 km^2) also are scattered throughout the SEZ, with additional private lands in near proximity to its external boundaries. There is also one section of state land surrounded by the SEZ. The city of Blythe, California, on the eastern side of the SEZ, is surrounded by an extensive block of agricultural lands irrigated with water from the Colorado River.

A Section 368 federally designated, 2-mi (3-km) wide energy corridor on BLM administered lands overlaps the SEZ along I-10. This corridor, which was originally established in the CDCA Plan (BLM 1999), was recently also identified as a Section 368 corridor in the West-wide Corridor PEIS (DOE and DOI 2008) (see also Section 3.2.5). There are also two north-south corridors within the SEZ that were designated as part of the CDCA Plan. One corridor is located in the western portion of the SEZ and one in the eastern portion. Although both corridors have one transmission line in them, these corridors now may not be fully functional since the eastern one crosses designated BLM wilderness (Big Maria Mountains and Rice Valley WAs) and the western one crosses Joshua Tree NP. The portions of the corridors south of the designated wildernesses and the park may still be useful.

As of February 2010, there were 15 active solar development applications wholly or partially within the Riverside East SEZ boundaries. Four of these applications are BLM fast-track projects for which environmental reviews have begun.

9.4.2.2 Impacts

9.4.2.2.1 Construction and Operations

Development of the proposed Riverside East SEZ for utility-scale solar energy production would establish a large and continuous industrial area along the 45-mi (72-km) stretch of I-10 and in large blocks of public lands north and south of the highway. The SEZ would exclude many existing and potential uses of the land, perhaps in perpetuity. Since much of the SEZ is undeveloped and rural, utility-scale solar energy development would be a new and discordant land use to the area. Development along the I-10 corridor, State Route 177, and Midland Road would be highly visible to the public traveling these routes. In addition, solar development in the western portion of the SEZ along State Route 177 and County Road 2 could create conflict with existing residential use near Desert Center, Lake Tamarisk Resort, and scattered private residences, including those associated with agricultural development. It also is possible that with private land owner and state agreement, the 11,640 acres (47 km^2) of private and state lands located within the external boundary of the SEZ eventually could be developed in the same or a complementary manner as the public lands.

Current ROW authorizations on the SEZ would not be affected by solar energy development, because they are prior rights. Should the area be identified as an SEZ in the ROD for this PEIS, the BLM would still have discretion to authorize additional ROWs in the area until solar energy development was approved, and then future ROWs would be subject to the rights granted for solar energy development.

The parts of the three designated energy corridors that overlap the proposed SEZ, and solar energy development of the SEZ, are currently in conflict with solar development, because to avoid technical or operational interference with transmission facilities, solar energy facilities cannot be constructed under transmission lines or over pipelines. The designated Section 368 transmission corridor along I-10 overlaps 15,700 acres (64 km^2) within the SEZ and could limit future solar development in that overlap area. The same constraint also may apply to the remaining two corridors on the east and west sides of the SEZ. Alternatively, designation of the SEZ could limit future use of these existing corridors. Transmission capacity is becoming a more critical factor and reducing the east-west corridor capacity through this SEZ may have future but currently unknown consequences. Near the western end of the SEZ, south of I-10, the existing corridor is limited by designated wilderness to the south and existing pipeline and transmission line development; thus opportunities to place new transmission facilities in this corridor are already constrained. This is an administrative conflict that can be addressed by the BLM in the land use planning process, but there would be implications either for the amount of potential solar energy development or for the amount of transmission capacity that can be accommodated.

The current public land ownership pattern, along with terrain and drainage features in the SEZ, could lead to the creation of isolated parcels of BLM-administered land scattered among solar facilities that would be both inaccessible to the public and difficult to manage.

9.4.2.2.2 Transmission Facilities and Other Off-Site Infrastructure

An existing 500-kV transmission line runs east–west along I-10 and parallel to the southern SEZ boundary. In addition, a 230-kV line passes through the far western section of the SEZ and a 69-kV line passes through the eastern portion of the SEZ. Establishing a connection to an existing line would not involve the construction of a new transmission line outside of the SEZ. If a connecting transmission line were constructed in a different location outside of the SEZ in the future, site developers would need to determine the impacts from construction and operation of that line. In addition, developers would need to determine the impacts of line upgrades if they were needed.

Existing road access to the proposed Riverside East SEZ should be adequate to support construction and operation of solar facilities, because I-10 passes along the southern edge of the SEZ and there are several exits from I-10 as it passes by and through the SEZ. Because of the site access provided by I-10, no additional road construction outside of the SEZ was assumed to be required to support solar development of the SEZ.

9.4.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features were identified. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's proposed Solar Energy Program would provide mitigation for some identified impacts. The exceptions would be impacts related to the exclusion of many existing and potential uses of the public land, perhaps in perpetuity; the visual impact of an industrial-looking solar facility within an otherwise rural area; and induced land use changes on state and private lands.

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9.4.3 Specially Designated Areas and Lands with Wilderness Characteristics

9.4.3.1 Affected Environment

The proposed Riverside East SEZ is located in the CDCA and is surrounded by specially designated areas, including Joshua Tree NP, seven designated WAs (including wilderness in the Joshua Tree NP), and seven ACECs (see Figure 9.4.3.1-1). Corn Springs is the only ACEC within the viewshed of the SEZ that has scenic values as one of its attributes. Alligator Rock, Chuckwalla DWMA, Chuckwalla Valley Dune Thicket, Desert Lily Preserve, Mule Mountains, and Palen Dry Lake ACECs are identified for the protection of plant and animal species and cultural or prehistoric resources. No lands with wilderness characteristics outside of designated WAs and WSAs have been identified within 25 mi (40 km) of the SEZ.

As part of the planning process for the BLM-administered lands in the CDCA, all public lands except for about 300,000 acres (1,214 km^2) of scattered parcels were designated geographically into one of four multiple-use classes. The classification was based on the sensitivity of resources and kinds of uses for each geographic area. The four multiple-use classes are as follows (BLM 1999):

- Class C is for lands either designated as wilderness or for wilderness study areas. These lands are managed to protect their wilderness characteristics.

- Class L (Limited Use) protects sensitive, natural, scenic, ecological, and cultural resource values. Public lands designated as Class L are managed to provide for generally lower intensity, carefully controlled multiple use of resources, while ensuring that sensitive values are not significantly diminished.

- Class M (Moderate Use) is based upon a controlled balance between higher intensity use and protection of public lands. This class provides for a wide variety of present and future uses such as mining, livestock grazing, recreation, energy, and utility development. Class M management is also designed to conserve desert resources and to mitigate damage to those resources that permitted uses may cause.

- Class I (Intensive use). Its purpose is to provide for concentrated use of lands and resources to meet human needs. Reasonable protection will be provided for sensitive natural and cultural values. Mitigation of impacts on resources and rehabilitation of affected areas will occur insofar as possible.

Lands within the Riverside East SEZ are predominantly Class M with the exception of two parcels around Joshua Tree NP and the Palen McCoy WA, which are Class L. The Multiple-Use Class Guidelines contained in the CDCA Plan indicate that wind, solar, or geothermal electrical generation facilities could be allowed in both of these Classes.

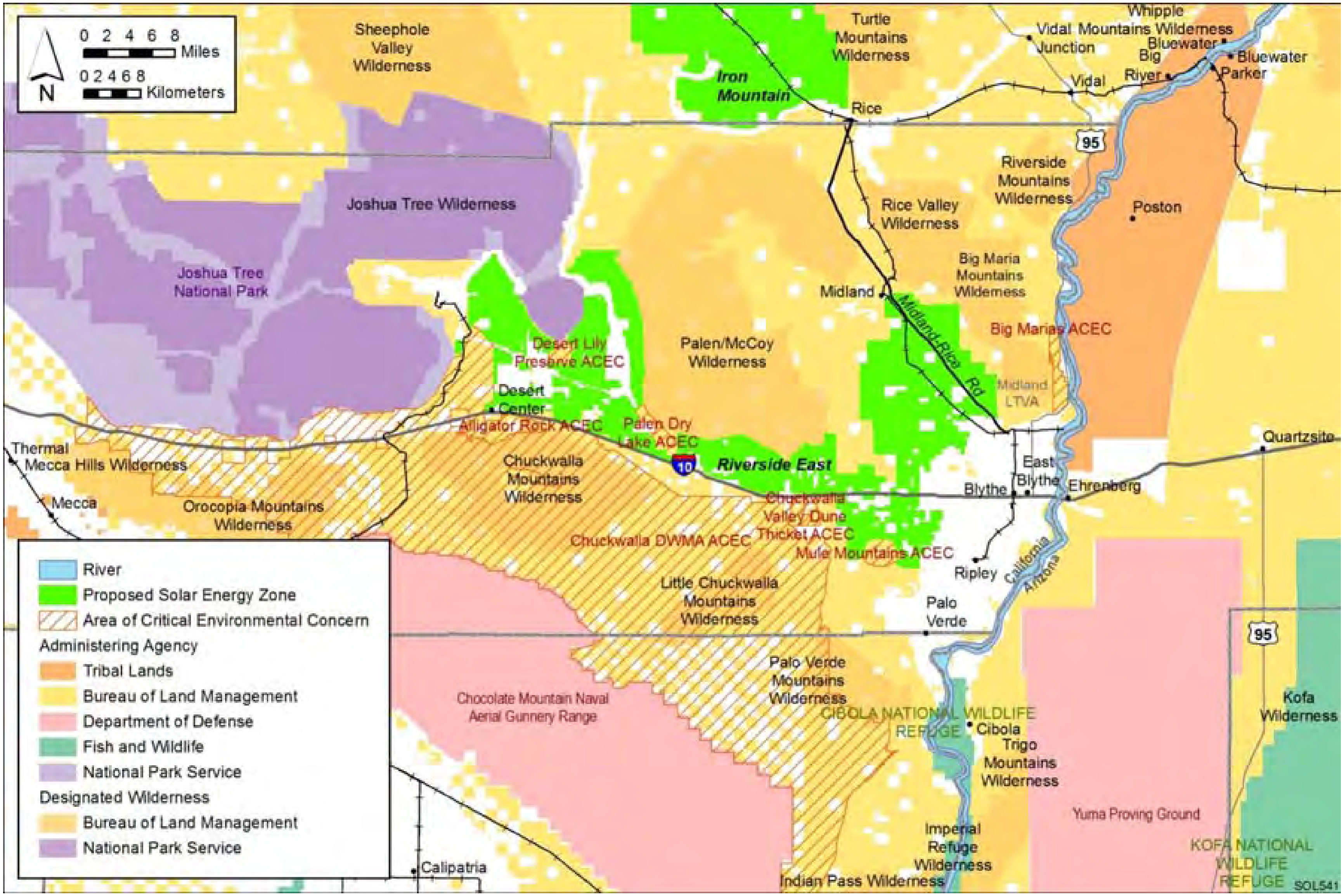

FIGURE 9.4.3.1-1 Specially Designated Areas in the Vicinity of the Proposed Riverside East SEZ

9.4.3.2 Impacts

9.4.3.2.1 Construction and Operations

The potential impact from solar development within the proposed Riverside East SEZ on specially designated areas possessing unique or sensitive visual resources is difficult to quantify and would vary by solar technology employed, the size of the area developed for solar energy facilities, the specific area affected, and the perception of individuals viewing the development. Development of the SEZ, especially full development, would be a dominating factor in the viewshed from large portions of some of these specially designated areas, as summarized in Table 9.4.3.2-1. This table assumes the use of the power tower solar energy technology, which would have the largest potential visual effect because of the height of this type of facility. The potential impacts in terms of acreage of visually sensitive, specially designated areas affected would be somewhat less for smaller solar energy facilities. See Section 9.4.14 for a more complete review of these impacts.

In general, the closer a viewer is to solar development, the greater the apparent size and level of detail visible, usually resulting in greater perceived impacts on various resources. Although impact levels are usually “banded” based on distance (e.g., 0 to 5 mi, 5 to 15 mi [0 to 8 km, 8 to 24 km]), in general, actual perceived impacts decrease gradually as distance increases. Additionally, dense solar facilities and/or large solar facilities may have very large visual impacts, even at longer distances. See Section 9.4.14 for a more thorough discussion of visual impacts associated with solar energy development.

The viewing height above a solar development area also is important to perceived impact levels, since higher elevation viewpoints show more of the facilities and make the regular, man-made geometry of the solar arrays more apparent. In the case of the Riverside East SEZ, the low elevation of the SEZ in relation to surrounding specially designated areas would tend to highlight the industrial development present in the SEZ.

An individual viewer’s expectations can also influence perceived impacts. For example, recreationists seeking a wilderness or national park experience would likely be more adversely affected by the sight of intensive solar development than commuting workers traveling along the highway.

The occurrence of glint and glare at solar facilities could potentially cause large though temporary increases in brightness and visibility of the facilities. The visual contrast levels that were assumed to assess potential impacts on specially designated areas do not account for potential glint and glare effects; however, these effects would be incorporated into a future site- and project-specific assessment that would be conducted for specific proposed utility-scale solar energy projects.

TABLE 9.4.3.2-1 Specially Designated Areas Potentially within the Viewshed of Solar Facilities within the Proposed Riverside East SEZ

		In 5-mi (8-km) Viewshed		In 15-mi (24-km) Viewshed		In 25-mi (40-km) Viewshed	
Area Name	Total Acres	Acres	Percentage	Acres	Percentage	Acres	Percentage
California Desert Conservation Area	25,919,319[a]	763,254	2.9	1,243,222	4.8	1,494,552	5.8
Joshua Tree NP	793,331	53,426	6.7	111,416	14.0	117,591	14.8
Cibola National Wildlife Refuge	18,398			7,336	39.9	17,121	93.1
Corn Springs ACEC	2,463	352	14.3	1,075	43.6	1,080	43.8
WAs							
Big Maria Mountains	46,056	8,873	19.3	8,829	19.2	8,875	19.3
Chuckwalla Mountains	88,202	31,482	35.7	49,952	56.6	49,913	56.6
Joshua Tree	586,623	40,421	6.9	96,117	16.4	99,460	17.0
Little Chuckwalla Mountains	28,708	76	0.3	16,679	58.1	16,729	58.3
Palen/McCoy	224,414	95,559	42.6	170,666	76.0	170,660	76.0
Palo Verde Mountains	30,403			13,254	43.6	13,252	43.6
Rice Valley	43,412	7,881	18.2	35,773	82.4	35,792	82.4

[a] To convert acres to km^2, multiply by 0.004047.

There are seven ACECs near the SEZ. Potential impacts on these ACECs are indirect and related to the potential impact from additional human use of the areas because of the construction and operation of solar facilities. Four of these ACECs (Chuckwalla DWMA, Desert Lily Preserve, Palen Dry Lake, and Mule Mountains) are immediately adjacent to the boundaries of the SEZ.

Because the western portion of the SEZ currently contains numerous visible man-made features, impacts on wilderness and scenic values may be somewhat less significant than in areas that are more pristine.

The lack of development in the immediate region of the SEZ makes the night sky very dark and allows very good opportunities for night sky viewing. The NPS has identified concerns that solar facility development in the region both adjacent to and east of Joshua Tree NP could adversely affect the quality of the night sky environment as viewed from the park. The amount of light that may emanate from Riverside East solar facilities is not known but could affect night sky viewing from the NP and the surrounding wilderness areas.

Designated Wilderness

- The border of the Palen-McCoy WA abuts the Riverside East SEZ for about 33 mi (53 km) and is surrounded on three sides by the SEZ. Large portions of the viewshed from this wilderness area are not pristine; it includes an array of human-built structures (e.g., highways, roads, housing, railroads) as close as 2 mi (3 km) from its boundaries, which already have some effect on wilderness characteristics. However, because of the size and density of solar development, especially at full development, the new visual impacts of solar energy facilities generally would be much more intrusive than those that currently exist.

  Designated wilderness within the 5 mi (8 km) viewshed of the SEZ includes about 96,000 acres (388 km^2) (see Table 9.4.3.2-1). Within 15 mi (24 km) of the SEZ, about 171,000 acres (692 km^2) of designated wilderness is included within the viewshed of the SEZ. Cumulatively, this amounts to about 76% of the wilderness area. Additionally, the wilderness area would have clear and close views of the Iron Mountain SEZ to the north of the WA that could result in the WA being completely ringed by solar energy development. It is anticipated that wilderness characteristics throughout this wilderness area would be adversely affected by the solar development in the SEZ and in the region.

- The Big Maria Mountains WA is within 0.25 to 2 mi (0.4 to 3 km) of the boundary of the SEZ for about 13 mi (21 km). The viewshed from the wilderness area is not pristine, but the unpaved road and railroad within the viewshed are located far enough to the west of the boundary of the wilderness area to not have a significant impact on the wilderness area. The affected viewshed is restricted to the western slopes of the wilderness area that are within about 5 mi (8 km) of the SEZ and which constitute about 19% of the wilderness area. This area would be adversely affected by SEZ development that could potentially fill the low-lying valley to the west and below the wilderness area. Because the view of the solar development would be so extensive, it is anticipated that the effect on wilderness characteristics in the portions of the wilderness area within the viewshed of the SEZ would be very large. The majority of the area within the wilderness area to the east is outside of the viewshed of the SEZ and would not be affected by development within the SEZ.

- The southern boundary of the Rice Valley WA ranges from 0.5 to 2 mi (1 to 3 km) from the boundary of the SEZ for about 6 mi (10 km). The viewshed from the southern boundary of the wilderness area is not pristine and is influenced by the presence of an unpaved road, railroad, and several large mining operations. The portion of the wilderness aera that would be in view of development within the SEZ within 5 mi (8 km) is about 7,881 acres (4 km^2), or about 18% of the wilderness area. In this area wilderness characteristics would be adversely affected by solar development in the SEZ that could potentially fill the low-lying valley to the south and below the wilderness area. Although the table shows a large acreage of the wilderness area within15 mi (24 km) of the SEZ, this is actually an anomaly in the viewshed analysis. The large majority of the wilderness area to the north actually is out of the viewshed of development within the SEZ and would not be affected by it (for more information on this, see the description of Rice Valley WA in Section 9.4.14.2.2.1)

- The Chuckwalla Mountains WA is located south of I-10 and the SEZ. The boundary of the wilderness area ranges from 1 to 3 mi (1.6 to 5 km) from the SEZ. The elevation of the wilderness area rises continuously to the south, affording unobstructed views of the SEZ to the north and east. About 31,000 acres (125 km^2) of the wilderness area is within the 5-mi (8-km) viewshed of the SEZ, and it is expected that wilderness characteristics within this area would be adversely affected. The current viewshed from this wilderness area is not pristine and includes an array of human-built structures (e.g., highways, roads, railroads, power lines, residences, and agricultural development) located from 0.5 to 5 mi (0.8 to 8 km) from the WA boundary. These projects already have some effect on wilderness characteristics; however, because of the size and density of solar development that would be in view from the WA, especially at full development, the new visual impacts of solar energy facilities generally would be much more intrusive than those impacts that currently exist. All of the Chuckwalla WA is within about 12 mi (19 km) of the SEZ, and within this distance about 56% of the WA, about 50,000 acres (202 km^2) is within the viewshed of the SEZ. At full development, solar facilities could stretch to about 13 mi to the north of the SEZ and more than 20 mi (32 km) east along I-10. Because of this extensive view of solar development, it is anticipated that the cumulative adverse impact on wilderness characteristics within areas of this wilderness area within view of the solar development would be large.

- The Little Chuckwalla and Palo Verde Mountains WAs are 5 and 6 mi (8 and 10 km), respectively, from the closest boundary of the SEZ. Both are almost completely contained within the 15-mi (24-km) radius of solar development and about 76% and 82% of the wilderness areas. respectively, would be included in the viewshed of the SEZ. The current viewshed from both wilderness areas is not pristine and includes an array of human-built structures; however, solar development, especially full development, would be very visible from within portions of both of these wilderness areas. Because of the extensive potential view of solar development to the north and east, there would be adverse impacts on wilderness characteristics in the Little Chuckwalla WA.

- For the Palo Verde Mountains WA, because of the alignment of the of the wilderness area relative to the SEZ, while the nearest boundary of the wilderness area is 6-mi (9.6-km) from the SEZ, most of the boundary where there is visibility of the SEZ is from 8 to10 mi (13 to 16 km) distant. Viewshed analysis indicates that contrast levels caused by solar facilities within the SEZ are not likely to exceed the moderate level. Because of the distance between the SEZ and the wilderness area, the expected level of contrast, partial screening of the area from the SEZ by the Mule Mountains, and the presence of extensive agricultural development within the viewshed of the SEZ, impacts on wilderness characteristics from solar development are anticipated to be minor.

Areas of Critical Environmental Concern

- The Corn Springs ACEC is designated for many reasons, including scenic resources. The primary scenic portion of the area is in the canyon that runs generally east–west and that is screened from the SEZ and would not be affected by it. Visitors would have clear views of the SEZ as they leave the area and travel down the bajada slopes toward I-10. The cultural resources found in the canyon are sensitive and could be adversely affected if development in the SEZ causes an increase in visitor traffic into the ACEC.

- Chuckwalla DWMA, Desert Lily Preserve, Mule Mountains, and Palen Dry Lake ACECs are located adjacent to the boundary of the SEZ (see Figure 9.4.3.1-1). Alligator Rock, Corn Springs, and Chuckwalla Valley Dune Thicket ACECs are located in close proximity to the SEZ but do not abut it. While these areas would not be directly affected by development of the SEZ, it is possible that additional human traffic could be drawn to the areas because of the solar facilities, and there is potential for unintended impact. The major threat to these areas is uncontrolled vehicle use or vandalism/theft of cultural or prehistoric resources and increased management efforts may be needed to protect the resources of these ACECs. In addition, indirect impacts resulting from edge effects such as non-native species establishment and spread, habitat degradation and fragmentation, and increased predation on desert tortoises by ravens may occur.

Joshua Tree National Park

- Portions of Joshua Tree NP are adjacent or in close proximity to the SEZ and would have extensive views of solar energy development in the valley below the park. About 53,000 acres (214 km^2) of the park is located within the 5-mi (8-km) viewshed of the SEZ, of which about 31,000 acres (125 km^2) is designated as wilderness. A portion of the Coxcomb Mountains in the park is surrounded on three sides by the SEZ. The 15-mi (24-km) viewshed of the SEZ includes about 111,000 acres (449 km^2) of the park, including about 96,000 acres (388 km^2) of wilderness. Although development on private and BLM lands has already reduced wilderness characteristics, the potential development of the SEZ would result in large additional adverse effects on wilderness characteristics in the park.

  The NPS has commented that the combined effects of solar energy development on public lands within and outside the SEZ adjacent to the park have a high potential to directly and negatively impact park resources in the Coxcomb and Eagle Mountains on the eastern boundary of the park. Primary concerns identified include potential for impacts on scenic views from the park, preservation of the desert soundscape, preservation of the night-sky viewing opportunities, and impacts on important wildlife corridors linking NPS- and BLM-managed lands.

  The eastern portion of the Joshua Tree NP affords visitors unimpeded night sky viewing opportunities, while western areas of the park are highly affected by light pollution from the Coachella Valley and Los Angeles areas. Maintaining the high quality of night sky viewing in the eastern portion of the park is a paramount concern of the NPS. The NPS's concerns relate to any artificial light from night time maintenance activity and/or security lighting within 20 mi (32 km) of the park boundaries.

California Desert Conservation Area

- The viewshed within 25 mi (40 km) of the Riverside East SEZ includes about 1,495,000 acres (6,050 km^2), or about 5.8% of the CDCA (Table 9.4.3.2-1). Installation of renewable energy facilities is consistent with the CDCA Plan, but full development of the SEZ would adversely affect wilderness characteristics in six designated wilderness areas including designated wilderness in Joshua Tree NP. Should solar energy development occur, because of the size and visual impact of solar facilities, the current undeveloped character of large portions of the CDCA would be changed.

Cibola National Wildlife Refuge

- The Cibola Refuge is about 10 mi (16 km) southeast of the southeastern portion of the SEZ. Although about 7,300 acres (30 km^2) of the refuge is within the 15-mi (24 km) viewshed of the SEZ, there are no anticipated impacts on the refuge.

9.4.3.2.2 Transmission Facilities and Other Off-Site Infrastructure

Because of the availability of an existing transmission line and access to I-10, no additional construction of transmission or road facilities was assessed. Should additional transmission lines be required outside of the SEZ, there may be additional impacts to specially designated areas. See Section 9.4.1.2 for the development assumptions underlying this analysis.

9.4.3.3 SEZ-Specific Design Features and Design Feature Effectiveness

Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's proposed Solar Energy Program, would provide some mitigation for identified impacts. The exceptions would be that SEZ development would adversely affect wilderness characteristics in the Palen-McCoy, Rice Valley, Big Maria Mountains, Chuckwalla Mountains, and Little Chuckwalla Mountains WAs and in Joshua Tree NP. These impacts would not be fully mitigable. The night sky viewing experience in the Joshua Tree NP could also be adversely affected. Required programmatic design features included in Appendix A, Section A.2.2, may reduce visual impacts on wilderness characteristics, scenic resources, and night sky viewing opportunities. It is anticipated that even with the adoption of the design features, adverse impacts on wilderness characteristics would not be completely mitigated and residual impacts would remain.

A proposed design feature specific to the proposed SEZ is as follows:

- Once construction of solar energy facilities begins, the BLM would monitor whether there are increases in traffic to the seven ACECs in and near the SEZ and determine whether additional design features are required to protect the resources in these areas.

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9.4.4 Rangeland Resources

Rangeland resources include livestock grazing and wild horses and burros, all of which are managed by the BLM. These resources and possible impacts on them from solar development within the proposed Riverside East SEZ are discussed in Sections 9.4.4.1 and 9.4.4.2.

9.4.4.1 Livestock Grazing

9.4.4.1.1 Affected Environment

A portion of the SEZ was at one time part of the Ford Dry Lake grazing allotment, but the allotment has been closed to grazing through a land use plan decision (BLM 2009c); no livestock grazing is authorized within the SEZ.

9.4.4.1.2 Impacts

There would be no impacts on livestock grazing.

9.4.4.1.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features would be necessary to protect or minimize impacts on livestock grazing.

9.4.4.2 Wild Horses and Burros

9.4.4.2.1 Affected Environment

Section 4.4.2 discusses wild horses (*Equus caballus*) and burros (*E. asinus*) that occur within the six-state study area. Twenty-two BLM wild horse and burro HMAs occur within California. Also, several HMAs in Arizona are located near the Arizona–California border. Portions of three HMAs are located within 50 mi (80 km) of the proposed Riverside East SEZ. The closest is the Cibola-Trigo HMA, located 9 mi (14 km) east of the SEZ (Figure 9.4.4.2-1). The Chemehuevi HMA is located about 27 mi (43 km) northeast of the SEZ, and the Chocolate-Mule Mountains HMA is about 15 m (24 km) south of the SEZ (Figure 9.4.4.2-1). The Cibola-Trigo HMA contains an estimated 285 horses and 393 burros, the Chemehuevi HMA an estimated 201 burros, and the Chocolate-Trigo HMA an estimated 120 burros (BLM 2009b).

In addition to the HMAs managed by the BLM, the U.S. Forest Service (USFWS) has 51 established wild horse and burro territories in Arizona, California, Nevada, New Mexico, and

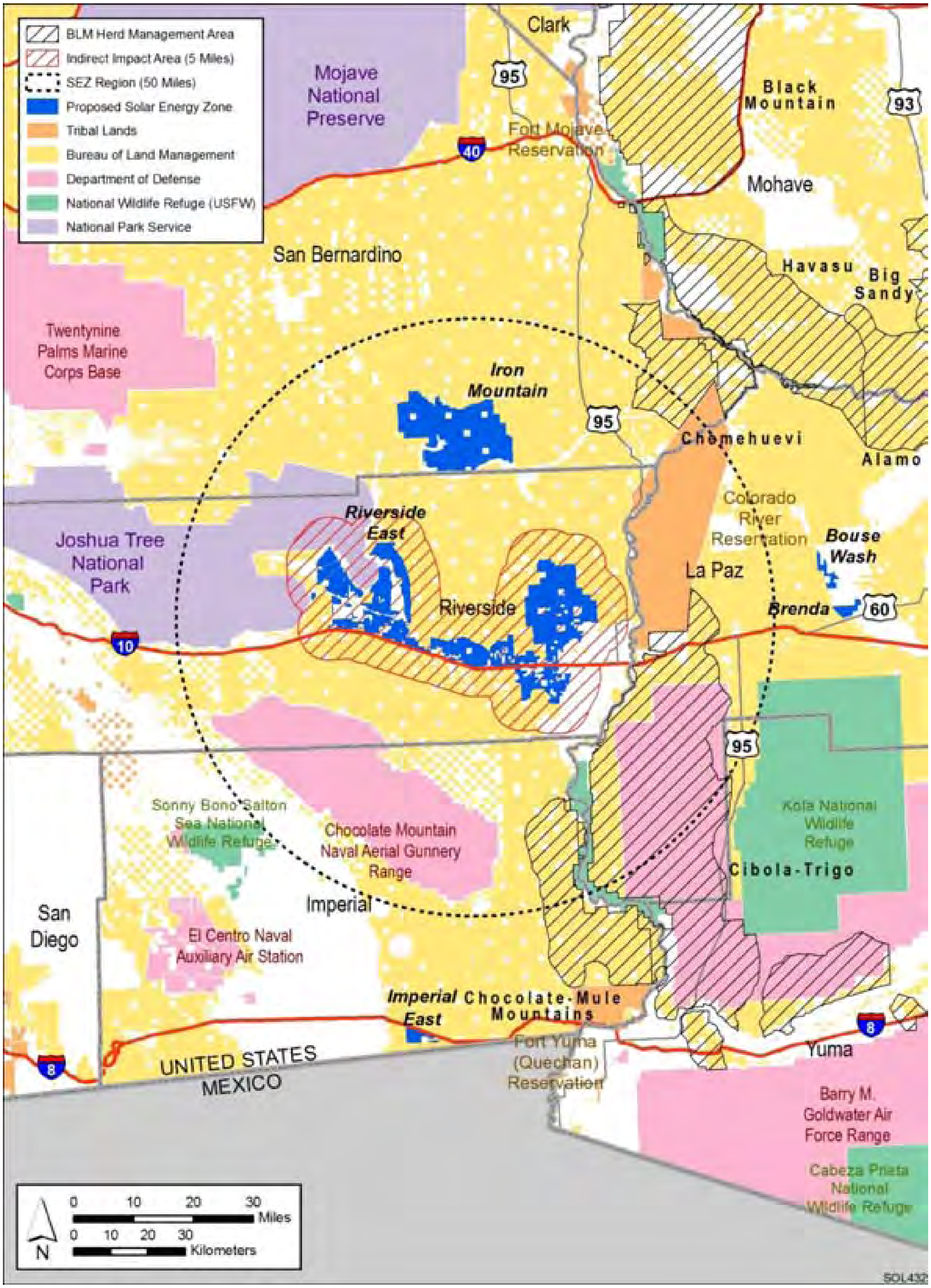

FIGURE 9.4.4.2-1 BLM Wild Horse and Burro HMAs Located near the Proposed Riverside East SEZ Region (Source: BLM 2009a)

Utah, and is the lead management agency that administers 37 of these territories (Giffen 2009; USFS 2007). The territory closest to the proposed Riverside East SEZ is the Big Bear Territory within the San Bernardino National Forest. It is located more than 70 mi (113 km) northwest of the SEZ. This territory is managed for a population of 60 wild burros (USFS 2007).

9.4.4.2.2 Impacts

Because the proposed Riverside East SEZ is 9 mi (14 km) or more from any wild horse and burro HMA and more than 70 mi (113 km) from any wild horse and burro territory administered by the USFS, solar energy development within the SEZ would not affect wild horses and burros managed by the BLM or the USFWS.

9.4.4.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A, Section A.2.2, would reduce the potential for effects on wild horses and burros. No SEZ-specific design features would be necessary to protect or minimize impacts on wild horses and burros.

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9.4.5 Recreation

9.4.5.1 Affected Environment

Although the proposed Riverside East SEZ is very flat, it has diverse vegetation and offers a range of seasonal recreation opportunities. While much of the area is dominated by creosote shrublands or areas with very little vegetation, the eastern portion of the SEZ, especially along McCoy Wash and its tributaries, contains a well-developed ironwood/palo verde community. During the hottest summer months, the SEZ does not provide an environment conducive to non-motorized recreation, but in the cooler months recreation opportunities are abundant. The area has been traditionally used by the residents of Desert Center, Blythe, and urban areas to the west. While no area-wide recreation data are available, the CDCA, like many remote areas of the public lands, attracts individuals and families who are seeking undeveloped recreation opportunities. Opportunities for exploration of old townsites, mining operations, and old roads as well as for wilderness activities, hunting and backcountry camping, hiking, and wildlife and wildflower viewing are important attractions throughout the CDCA. There are areas both in and adjacent to the Riverside East SEZ that provide these kinds of attractions.

The Midland Long-Term Visitor Area (LTVA) managed by the BLM provides long-term camping opportunities in the winter months and is located along Midland Road in the eastern portion of the SEZ. This area hosted an estimated 605,000 visitor days of use in the 2009 to 2010 recreation season and 437,000 visitor days in the 2008 to 2009 season. Many of the visitors likely access areas within the SEZ while they are staying at the LTVA.

The SEZ area was included in the Northern and Eastern Colorado Desert Coordinated Management Plan approved in 2002 (BLM 2002a,b). In the plan all routes of travel outside of closed and OHV open areas were designated as open, closed, or limited. Numerous routes of travel within the SEZ have been designated as available for use by vehicles. The Palen Pass Road is a popular route; the route leaves State Route 177 in the northwest corner of the SEZ, crosses between units of the Palen-McCoy WA, and travels to the southeast through portions of the eastern side of the SEZ, eventually ending at Blythe. There are many OHV routes designated as open within the proposed Riverside East SEZ; these are discussed in Section 9.4.21 and shown in Figure 9.4.21-1.

9.4.5.2 Impacts

9.4.5.2.1 Construction and Operations

Although there are no recreation use data for the SEZ and surrounding lands, it is not anticipated that there would be a significant loss of recreational use caused by development of the Riverside East SEZ. However, some recreation visitors would be displaced from the portions of the SEZ developed for solar energy production, and because of the impact of a large and highly visible industrial-type development in the SEZ, opportunities for undeveloped and primitive recreation experiences in and around the SEZ would be lost or reduced. Roads and trails through areas developed for solar power production could be closed or rerouted, although existing county roads would continue to provide general access where they exist. Because the Midland LTVA is located within the SEZ, solar development could occur very close to it and the impact on winter visitors is not known. The combination of increased traffic and solar development in the areas around the LTVA could discourage some use of this area.

Open OHV routes crossing areas granted ROWs for solar facilities would be redesignated as closed. However, a programmatic design feature addressing recreational impacts would require consideration of development of alternative routes that would retain a similar level of access across and to public lands as a part of the project proposal (see Section 5.5.1 for more details on how routes coinciding with proposed solar facilities would be treated).

Based on viewshed analysis, the SEZ would be visible from a wide area. Development of solar facilities in the SEZ would cause the loss of the currently expansive and undeveloped views throughout the SEZ. The viewshed within 25 mi (40 km) of the SEZ alone includes about 1,495,000 acres (6,050 km^2) within the CDCA (Table 9.4.3.2-1). The viewshed analysis shows the SEZ would be visible from portions of Joshua Tree NP, designated wilderness areas, other specially designated areas outside of the SEZ. Because of the anticipated adverse impact on wilderness characteristics in about 184,000 acres (745 km^2) of designated wilderness within the most sensitive 5-mi (8-km) visual zone surrounding the proposed SEZ, losses in opportunities for wilderness recreation use are anticipated. Recreational use of wilderness and other areas in Joshua Tree NP within the viewshed of the SEZ would also be adversely affected.

9.4.5.2.2 Transmission Facilities and Other Off-Site Infrastructure

Because of the availability of an existing transmission line and access to I-10, no additional construction of transmission or road facilities was assessed. Should additional transmission lines be required outside of the SEZ, there may be additional impacts on specially designated areas. See Section 9.4.1.2 for the development assumptions underlying this analysis.

9.4.5.3 SEZ-Specific Design Features and Design Feature Effectiveness

Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's proposed Solar Energy Program, would provide adequate mitigation for some identified impacts. The exceptions would be that some recreational use would be lost from the area within the SEZ, and this loss would not be mitigated. In addition, adverse impacts on wilderness recreation use in six designated wilderness areas, including within Joshua Tree NP, would also not be completely mitigated.

A proposed design features specific to the proposed SEZ is as follows:

- A buffer area between the Midland LTVA and solar development should be established to preserve the LTVA area. The size of the buffer should be determined based on the site and visitor specific criteria.

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9.4.6 Military and Civilian Aviation

9.4.6.1 Affected Environment

With the exception of a large portion of the eastern side of the SEZ, the SEZ is largely covered under eight MTRs that include a mixture of visual and instrument routes. Consequently, the BLM has identified this as an area for which advance consultation with the DoD is required prior to approval of activities that could adversely affect the use of the MTRs.

The Blythe public airport is located about 2 mi (3 km) southeast of the eastern portion of the SEZ, while the Desert Center public airport is located within the external boundaries of the SEZ on the western side.

9.4.6.2 Impacts

The development of any solar energy or transmission facilities that encroach into the airspace of an MTR could interfere with military training activities and could create a safety concern. While the military has indicated that solar development on portions of the Riverside East SEZ is compatible with its existing uses, it has also commented that other portions should have height limits for facilities, and some areas may be incompatible with existing military use (Brasher 2009).

The system of military airspace in the Southwest overlaps much of the area of highest interest for solar development, and there is the potential for solar development to result in cumulative effects on the system of MTRs that stretch beyond only one SEZ or solar project.

Thermal plumes from the air-cooled condensers could be hazardous to low-flying aircraft approaching or departing from either of the airports. In addition, glint and glare from reflective mirrors is a potential source of glare that could cause flash blindness to pilots approaching or departing the airports.

The proximity of the two public airports to the SEZ would require close coordination with airport authorities and the FAA to ensure solar energy facilities do not interfere with airport operation.

9.4.6.3 SEZ-Specific Design Features and Design Feature Effectiveness

Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's proposed Solar Energy Program, would provide adequate mitigation for some identified impacts. An exception could be the potential impact on pilots using the two local airports caused by glint and glare from reflective surfaces and from thermal plumes from solar facilities.

Proposed design features specific to the proposed SEZ include the following:

- Coordination with the FAA and local airport authorities should be required early in the project planning process to identify and mitigate potential impacts on the local airports.

Precautions for pilots should be taken to avoid interference with flight paths or related flight operations and to avoid reflector glare hazards and thermal plumes.

9.4.7 Geologic Setting and Soil Resources

9.4.7.1 Affected Environment

9.4.7.1.1 Geologic Setting

Regional Geology

The proposed Riverside East SEZ lies within the eastern Mojave Desert region of the Basin and Range physiographic province in southeastern California. The western part of the SEZ covers land north of I-10 along the entire length of the Chuckwalla Valley and the southern part of Palen Valley. The Chuckwalla Valley is a 40-mi (64-km) long, northwest-trending intermontane basin that is bounded on the northwest by the Eagle Mountains and on the southwest by the Chuckwalla Mountains. The north-to-northwest-trending Coxcomb, Palen, and McCoy Mountains are to the north. The SEZ extends northward from Chuckwalla Valley into Palen Valley, a 20-mi (32-km) long, northwest-trending basin bounded on the southwest by the Coxcomb Mountains and on the northeast and east by the Granite and Palen Mountains, respectively (Figure 9.4.7.1-1).

The eastern portion of the proposed Riverside East SEZ sits on the Palo Verde Mesa, covering land both north and south of I-10. The mesa is bounded on the west-southwest by the McCoy Mountains and on the north and northeast by the Little Maria and Big Maria Mountains. The Palo Verde Valley, a river valley of the Colorado River, lies to the east (Figure 9.4.7.1-1).

Exposed sediments in the Chuckwalla Valley consist mainly of modern alluvium, playa deposits, and dune sands (Figure 9.4.7.1-2). These sediments are underlain by basin-fill deposits of alluvium and fanglomerate of the Pinto (Pleistocene) and Bouse (Pliocene) Formations. Basin-fill is estimated to be as thick as 1 mi (1.6 km) in the central part of the valley and is the principal water-bearing units in the region (Rotstein et al. 1976; CDWR 2003; CEC 2010b). A good portion of the SEZ is covered by dune sand, especially along the central Chuckwalla Valley. Playa lake sediments, associated with Palen and Ford Dry Lakes, occur in the western and central parts of the SEZ. The surrounding mountains are composed of various igneous and metamorphic rocks of pre-Tertiary age covered by younger residual material.

Topography

The proposed Riverside East SEZ spans the length of the Chuckwalla Valley; its western end covers portions of the northern Chuckwalla and Palen Valleys and its eastern end covers the Palo Verde Mesa. The northern part of the Chuckwalla Valley (between the Eagle and Coxcomb Mountains) slopes to the southeast, with elevations ranging from greater than 820 ft (250 m) on the alluvial fan surfaces flanking the surrounding mountains to less than 660 ft (200 m) in the

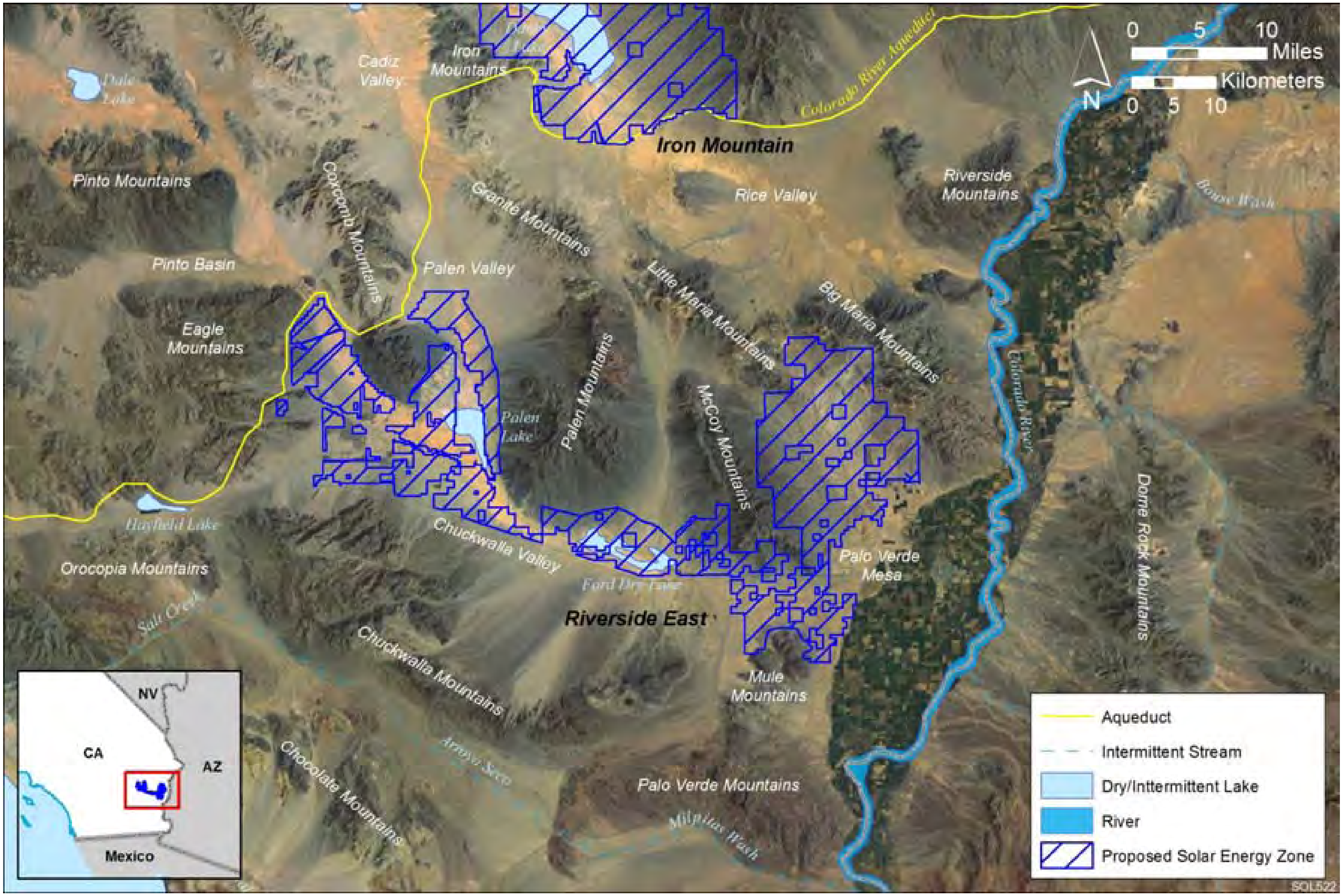

FIGURE 9.4.7.1-1 Physiographic Features in the Proposed Riverside East SEZ Region

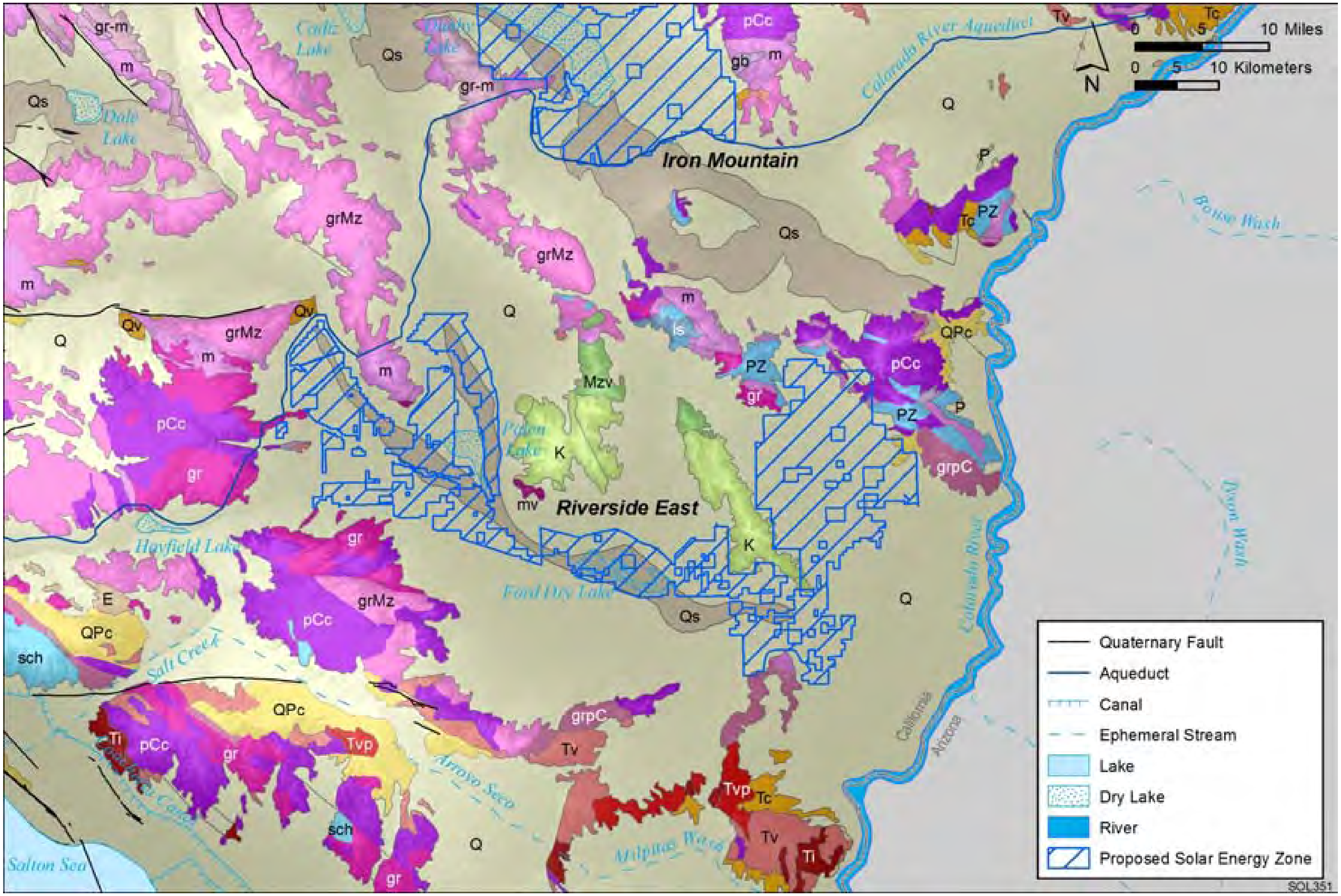

FIGURE 9.4.7.1-2 Geologic Map of the Proposed Riverside East SEZ Region (adapted from Ludington et al. 2007 and Gutierrez et al. 2010)

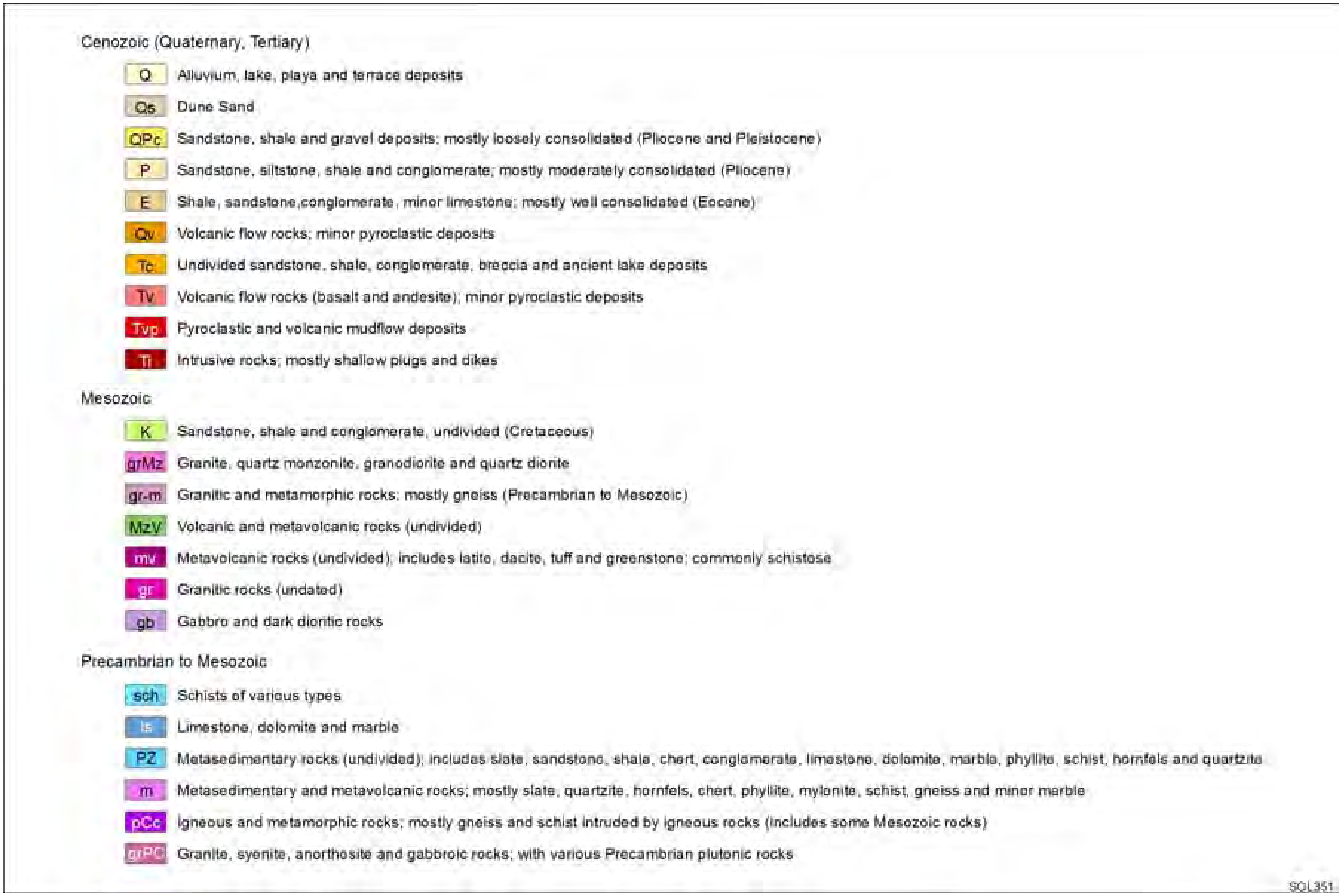

FIGURE 9.4.7.1-2 (Cont.)

center of the valley. The Palen Valley slopes to the south-southeast. It is rimmed with alluvial fans that coalesce in the center of the valley. Streams discharging to the valley drain to the lowest elevation (about 430 ft [130 m]) at Palen Lake (Figure 9.4.7.1-3).

The central part of the Chuckwalla Valley trends to the east-southeast and is nearly flat. The lowest elevations occur within Ford Dry Lake (Figure 9.4.7-3).

Palo Verde Mesa is situated between the McCoy, Little Maria, and Big Maria Mountains. It slopes to the southeast and ranges in elevation from 820 ft (250 m) along the flanks of the surrounding mountain to less than 330 ft (100 m) along the its southeast-facing edge, which borders the Mesa Verde (Colorado River) Valley. The mesa is drained by the McCoy Wash, a perennial stream that flows to the southeast and discharges to a series of canals in the Mesa Verde Valley (Figure 9.4.7.1-3).

Geologic Hazards

The types of geologic hazards that could potentially affect solar project sites and their mitigation are discussed in Sections 5.7.3 and 5.7.4.2. The following sections provide a preliminary assessment of these hazards at the proposed Riverside East SEZ. Solar project developers may need to conduct a geotechnical investigation to assess geologic hazards locally to better identify facility design criteria and site-specific mitigation measures to minimize their risk.

Seismicity. The proposed Riverside East SEZ is located to the southeast of the Eastern California Shear Zone and due east of the San Andreas Fault Zone—both seismically active regions dominated by northwest-trending right-lateral strike slip faulting and categorized as “potentially active” (i.e., having surface displacement within the last 11,000 years [Holocene]) under the Alquist-Priolo Earthquake Fault Zoning Act (Figure 9.4.7.1-4). The term “potentially active” generally denotes that a fault has shown evidence of surface displacement during Quaternary time (the last 1.6 million years). However, because there are numerous such faults in California, the State Geologist has introduced new, more discriminating criteria for zoning faults under the Alquist-Priolo Act. Currently, zoned faults include those that are “sufficiently active,” showing evidence of surface displacement within the past 11,000 years along one or more of its segments or branches, and “well-defined,” having a clearly detectable trace at or just below the ground surface (Bryant and Hart 2007).

The Chuckwalla Valley is about 50 mi (80 km) to the southeast of the Pinto Mountain Fault Zone in Riverside County. The active left-lateral strike-slip fault forms a south-facing escarpment along the south margin of the eastern San Bernardino Mountains and marks the boundary between the Transverse Range and the Mojave Desert. Offsets of late Pleistocene and Holocene sediments place the most recent movement along the fault at less than 15,000 years ago. Slip rate and recurrence interval data for the Pinto Mountain fault have not been reported; however, minor slip occurred along traces of the fault zone during the 7.3 magnitude Landers earthquake (a few miles to the south) on June 27, 1992 (Bryant 2000).

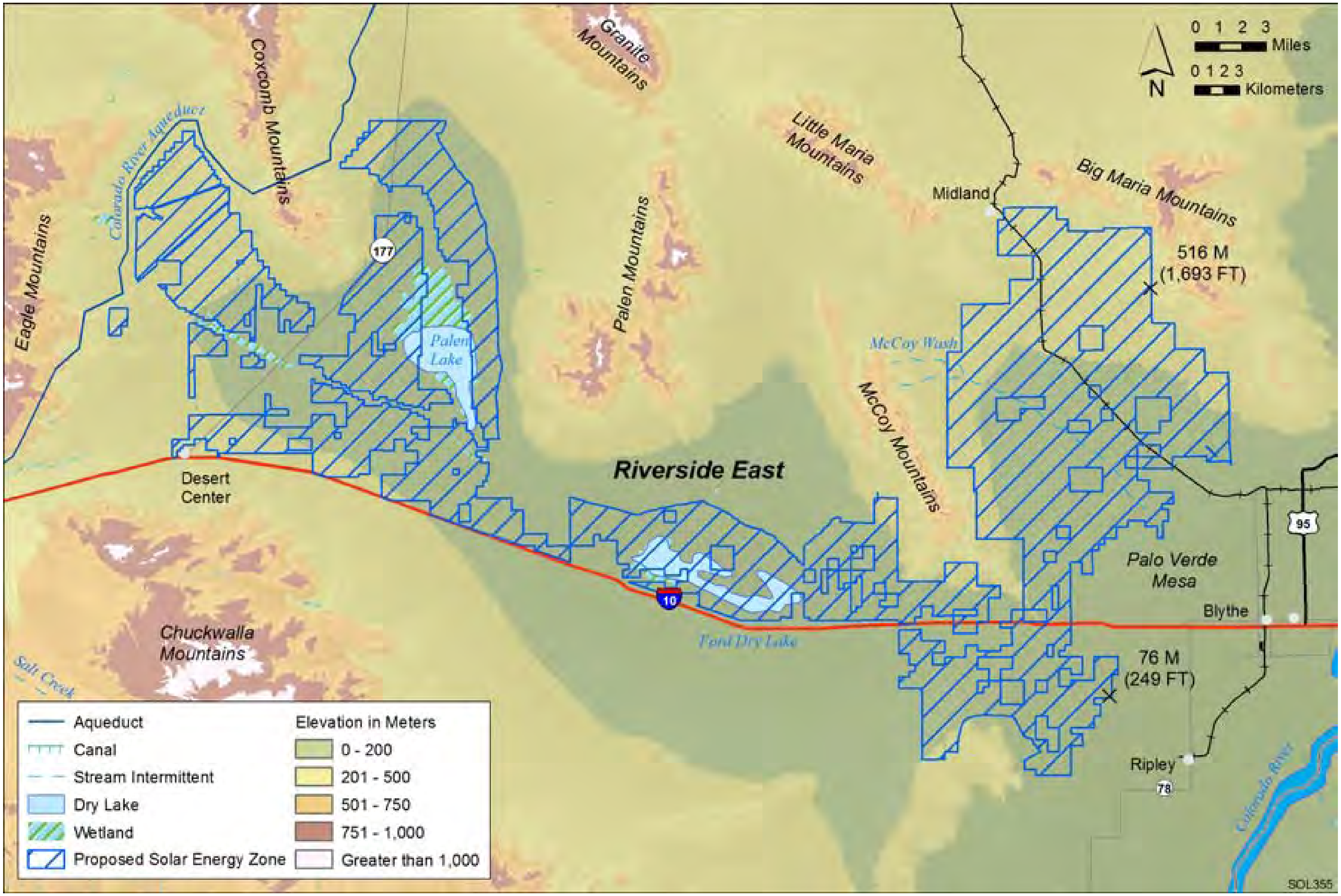

FIGURE 9.4.7.1-3 General Terrain of the Proposed Riverside East SEZ

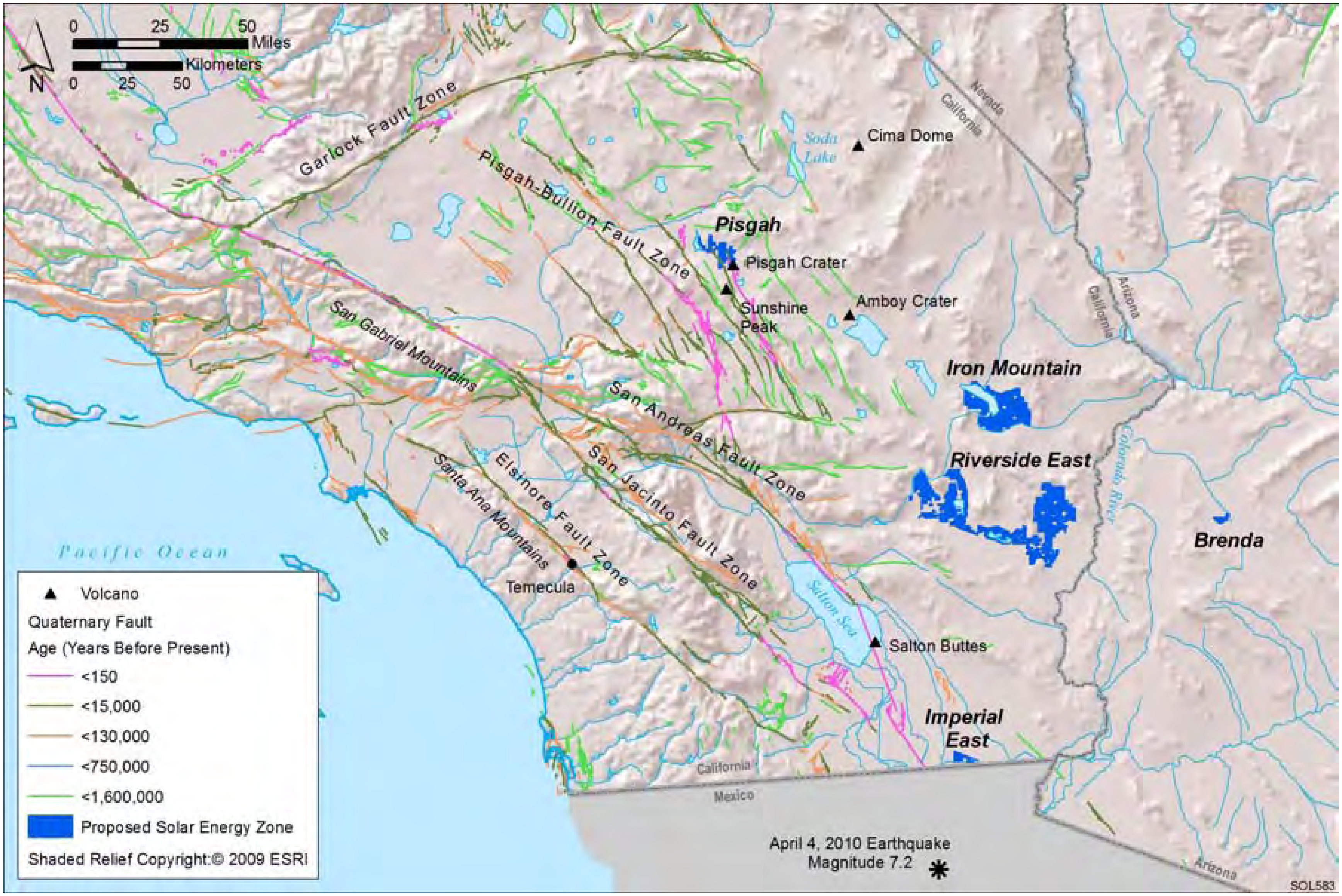

FIGURE 9.4.7.1-4 Quaternary Faults and Volcanoes in Southern California (Sources: USGS and CGS 2009; USGS 2010e)

The Coachella Valley and San Bernardino Mountains sections of the San Andreas Fault Zone are located about 35 mi (56 km) southwest of Chuckwalla Valley. The fault zone is a network of historically active right-lateral strike-slip faults that together compose the transverse boundary between the North American and Pacific plates. It stretches along most of California's coastline southeast to the northern Transverse Range and inland to the Salton Sea (Figure 9.4.7.1-4). Two major historic earthquakes have occurred along the San Andreas Fault: the 1857 Fort Tejon earthquake (magnitude 7.9) and the 1906 San Francisco earthquake (magnitude 7.8). Several smaller surface-rupturing earthquakes have also occurred in historic time. Quaternary to Holocene creep rates ranging from 0.9 to 1.4 in./yr (23 to 35 mm/yr) have been reported for the Coachella Valley and San Bernardino Mountains sections of the fault zone. Average recurrence intervals are estimated to range from 150 to 275 years for the San Bernardino Mountains section and 207 to 233 years for the Coachella Valley section (Bryant and Lundberg 2002a; Matti et al. 1992; USGS 1988). The USGS (1988) estimates that the most recent activity along the Coachella Valley section was about 1,680 ± 40 years ago.

Since 1973, about 835 earthquakes have been recorded within a 61-mi (100-km) radius of the Riverside East SEZ. Three of these earthquakes registered Richter scale magnitudes greater than 6.0: October 16, 1979 (ML[1] 6.1); April 26, 1981 (ML 6.3); and November 24, 1987 (ML 6.5). These earthquakes were centered along segments of the San Jacinto Fault Zone and Brawley Seismic Zone located south of the Salton Sea (USGS 2010e).

Liquefaction. The proposed Riverside East SEZ lies within an area where the peak horizontal acceleration with a 10% probability of exceedance in 50 years is between 0.06 and 0.20 g. Shaking associated with this level of acceleration is generally perceived as weak to light; damage to structures would not be expected (USGS 2008b).

A regional evaluation for liquefaction hazards was completed for the San Bernardino Valley and vicinity in western San Bernardino county by Matti and Carson (1991); the study did not include the eastern part of San Bernardino county or Riverside county where the proposed Riverside East SEZ is located. San Bernardino Valley is located between the San Andreas and San Jacinto Fault Zones, where the peak horizontal acceleration with a 10% probability of exceedance in 50 years is much higher (between 0.88 and 1.62 g) than that calculated for the Chuckwalla Valley; therefore, only general conclusions from the study are presented here.

The evaluation considered three aspects of liquefaction: susceptibility, opportunity, and potential. Susceptibility identifies sedimentary materials that are likely to liquefy during a seismic event on the basis of their physical properties, depth to groundwater, expected earthquake magnitude, and strength of ground shaking. Opportunity considers the recurrence intervals for earthquake shaking strong enough to cause liquefaction in susceptible materials. The potential for ground failure due to liquefaction evaluation then combines the results of the

[1] Richter scale magnitude (ML) was the original magnitude defined by Richter and Gutenberg for local earthquakes in 1935. It was based on the maximum amplitude recorded on a Wood-Anderson torsion seismograph but is currently calculated for earthquakes with magnitudes ranging from 2 to 6, using modern instruments with adjustments (USGS 2010f).

susceptibility and opportunity evaluations and identifies areas that are most and least likely to experience liquefaction (Matti and Carson 1991).

Investigators found that the level of liquefaction susceptibility was most dependent on two factors: (1) depth to the groundwater table and (2) the intensity and duration of ground shaking as determined by an earthquake's magnitude and the distance from the causative fault. These factors in combination with penetration-resistance data from various locations within the San Bernardino valley allowed them to conclude that liquefaction susceptibility gradually decreases with increasing depth to groundwater, increasing distance away from the causative fault, and increasing geologic age (and induration) of sedimentary materials. Although the playa sediments at Palen and Ford Dry Lakes could be considered susceptible to liquefaction since groundwater occurs near the surface (Section 9.4.9.1.2), the low intensity of ground shaking estimated for the general area indicates that the potential for liquefaction in the Chuckwalla Valley sediments is also likely to be low.

Volcanic Hazards. The nearest volcanoes are in the Amboy Crater and lava field (part of the Lavic Lake volcanic field), about 70 mi (110 km) northwest of the Riverside East SEZ and immediately northwest of Bristol Dry Lake (Figure 9.4.7.1-4). Amboy Crater is a 250-ft (76-m) high complex basaltic cinder cone surrounded by about 24.1 mi^2 (62 km^2) of mafic lava flows. The basalt fields erupted from several vents about 10,000 years ago. Hazards resulting from these eruptions likely would be less severe than those from more silicic sources; they include the formation of cinder cones, small volumes of tephra, and lava flows (Parker 1963; Miller 1989).

The Pisgah Crater (also part of the Lavic Lake volcanic field), is immediately adjacent to the southeast corner of the Pisgah SEZ, about 105 mi (170 km) northwest of the Riverside East SEZ (Figure 9.4.7.1-4). The 328-ft (100-m) high cinder cone is the youngest vent in the basalt field. Lava flows issuing from vents within the basalt field sit above alluvial fan and playa lake deposits. A similar, lesser known cinder cone and lava field also is present in the Sunshine Peak area, about 6 mi (10 km) south. Researchers date the most recent activity associated with the Pisgah volcano to about 25,000 years ago (Smithsonian 2010; Bassett and Kupfer 1964). Because of the basaltic composition of the Pisgah Crater lava, hazards likely would be similar to those described for the Amboy Crater but would depend on factors such as location, size, and timing (season).

The Cima dome and volcanic field east of Soda Lake is about 120 mi (190 km) north–northwest of the Riverside East SEZ (Figure 9.4.7.1-4). The volcanic field consists of about 40 basaltic cones and more than 60 associated mafic lava flows covering an area of about 58 mi^2 (150 km^2). It has had three periods of activity from the late Miocene through the late Pleistocene, the most recent having occurred about 15,000 years ago (Dohrenwend et al. 1984). Because of its basaltic nature, hazards associated with the Cima volcanic field would like be similar to those described for the Lavic Lake volcanic field, but would depend on factors such as location, size, and timing (season).

The nearest active volcano is Mount St. Helens in the Cascade Range (Washington), about 935 mi (1,505 km) north–northwest of the Chuckwalla Valley, which has shown some activity as recently as 2008. The nearest volcano that meets the criterion for an unrest episode is the Long Valley Caldera in east-central California, about 350 mi (565 km) northwest, which has experienced recurrent earthquake swarms, changes in thermal springs and gas emissions, and uplift since 1980 (Diefenbach et al. 2009). The Long Valley Caldera is part of the Mono-Inyo Craters volcanic chain, which extends from Mammoth Mountain (on the caldera rim) northward about 25 mi (40 km) to Mono Lake. Small to moderate eruptions have occurred at various sites along the volcanic chain in the past 5,000 years at intervals ranging from 250 to 700 years. Wind-blown ash from some of these eruptions is known to have drifted as far east as Nebraska. While the probability of an eruption within the volcanic chain in any given year is small (less than 1%), serious hazards could result from a future eruption. Depending on the location, size, timing (season), and type of eruption, hazards could include mudflows and flooding, pyroclastic flows, small to moderate volumes of tephra, and falling ash (Hill et al. 1998, 2000; Miller 1989).

Earthquake swarms also occurred at Medicine Lake Volcano in northern California (Cascade Range) for a few months in 1988. Medicine Lake is about 650 mi (1,050 km) northwest of the Riverside East SEZ (Diefenbach et al. 2009). The most recent eruption at Medicine Lake was rhyolitic in composition and occurred about 900 years ago (USGS 2010f). Nearby Lassen Peak last erupted between 1914 and 1917; at least two blasts during this period produced mudflows that inundated the valley floors of Hut and Lost Creeks to the east. Tephra from the most violent eruption, occurring on May 22, 1915, was carried by prevailing winds and deposited as far as 310 mi (500 km) to the east (Miller 1989).

Slope Stability and Land Subsidence. The incidence of rock falls and slope failures can be moderate to high along mountain fronts and can present a hazard to facilities on the relatively flat terrain of valley floors like the northern Chuckwalla and Palen Valleys if they are located at the base of steep slopes. The risk of rock falls and slope failures decreases toward the center of the flat valleys.

There has been no land subsidence monitoring within the Chuckwalla Valley to date; however, 32- to 64-ft (10- to 20-m) long earth fissures and 3-ft (1-m) wide sinkholes associated with subsidence have been documented in the Temecula area of southwestern Riverside County, about 105 mi (170 km) west–southwest of the proposed Riverside East SEZ (Figure 9.4.7.1-4). The subsidence is the result of groundwater overdrafts in the Temecula-Wolf Valley that have caused differential compaction in the sediments of the underlying aquifer. Land failure caused by sinkholes and fissures has been significant enough to damage buildings, roads, potable water and sewer lines, and other infrastructure (Corwin et al. 1991; Shlemon 1995). Land subsidence has also been documented as far back as the 1970s in southern California's San Joaquin Valley, where the maximum subsidence due to extensive groundwater withdrawals for irrigation is greater than 28 ft (9 m) (Galloway et al. 1999), and in the Wilmington Oil Field as a result of oil extraction from the Los Angeles basin in southern Los Angeles County (Kovach 1974).

Other Hazards. Other potential hazards at the proposed Riverside East SEZ include those associated with soil compaction (restricted infiltration and increased runoff), expanding clay soils (destabilization of structures), and hydro-compactable or collapsible soil (settlement). Disturbance of soil crusts and desert varnish (and pavement) on soil surfaces may also increase the likelihood of soil erosion by wind.

Alluvial fan surfaces, such as those typical of the northern Chuckwalla and Palen Valleys, can be the sites of damaging high-velocity flash floods and debris flows during periods of intense and prolonged rainfall. The nature of the flooding and sedimentation processes (e.g., streamflow versus debris flow) will depend on specific morphology of the fan (National Research Council 1996). Currently, a series of levees rim parts of the northern border of the proposed Riverside East SEZ in the northern Chuckwalla Valley (between the Eagle and Coxcomb Mountains) and Palen Valley (along the eastern flank of the Coxcomb Mountains). The levees channel runoff to the CRA and offer some protection from flash floods and debris flows (see Section 9.4.9.1.1). A series of diversion dikes also border the southern boundary of the SEZ along the central Chuckwalla Valley to channel drainage issuing from the Chuckwalla Mountains to the south.

9.4.7.1.2 Soil Resources

Because soil mapping is not complete for the Colorado Desert area, the map unit composition within the proposed Riverside East SEZ has not been delineated. Therefore, only soil series are shown in Figure 9.4.7.1-5 and described in Table 9.4.7.1-1. Soils within the SEZ are predominantly gravelly loams typical of alluvial fan terraces, which together make up about 64% of the site's soil coverage. These soils are gently to strongly sloping and characterized as well to excessively well drained, with low to high runoff, and moderate to moderately rapid permeability. Dune land soils, characterized by very rapid permeability and a high susceptibility for wind erosion, cover about 24% of the SEZ. The poorly drained soils of Ford Dry Lake make up only about 1% of the site's soil coverage. These soils are typical of ancient playa lake deposits, with iron oxide and high salinity precipitates near the surface (Worley-Parsons 2010). Biological soil crusts and desert pavement have not been documented in the SEZ, but may be present.

9.4.7.2 Impacts

Impacts on soil resources would occur mainly as a result of ground-disturbing activities (e.g., grading, excavating, and drilling), especially during the construction phase of a solar project. These include soil compaction, soil horizon mixing, soil erosion and deposition by wind, soil erosion by water and surface runoff, sedimentation, and soil contamination. Such impacts are common to all utility-scale solar energy facilities in varying degrees and are described in more detail for the four phases of development in Section 5.7.1.

Because impacts on soil resources result from ground-disturbing activities in the project area, soil impacts would be roughly proportional to the size of a given solar facility, with larger areas of disturbed soil having a greater potential for impacts than smaller areas (Section 5.7.2). The magnitude of impacts would also depend on the types of components built for a given facility since some components would involve greater disturbance and would take place over a longer time frame.

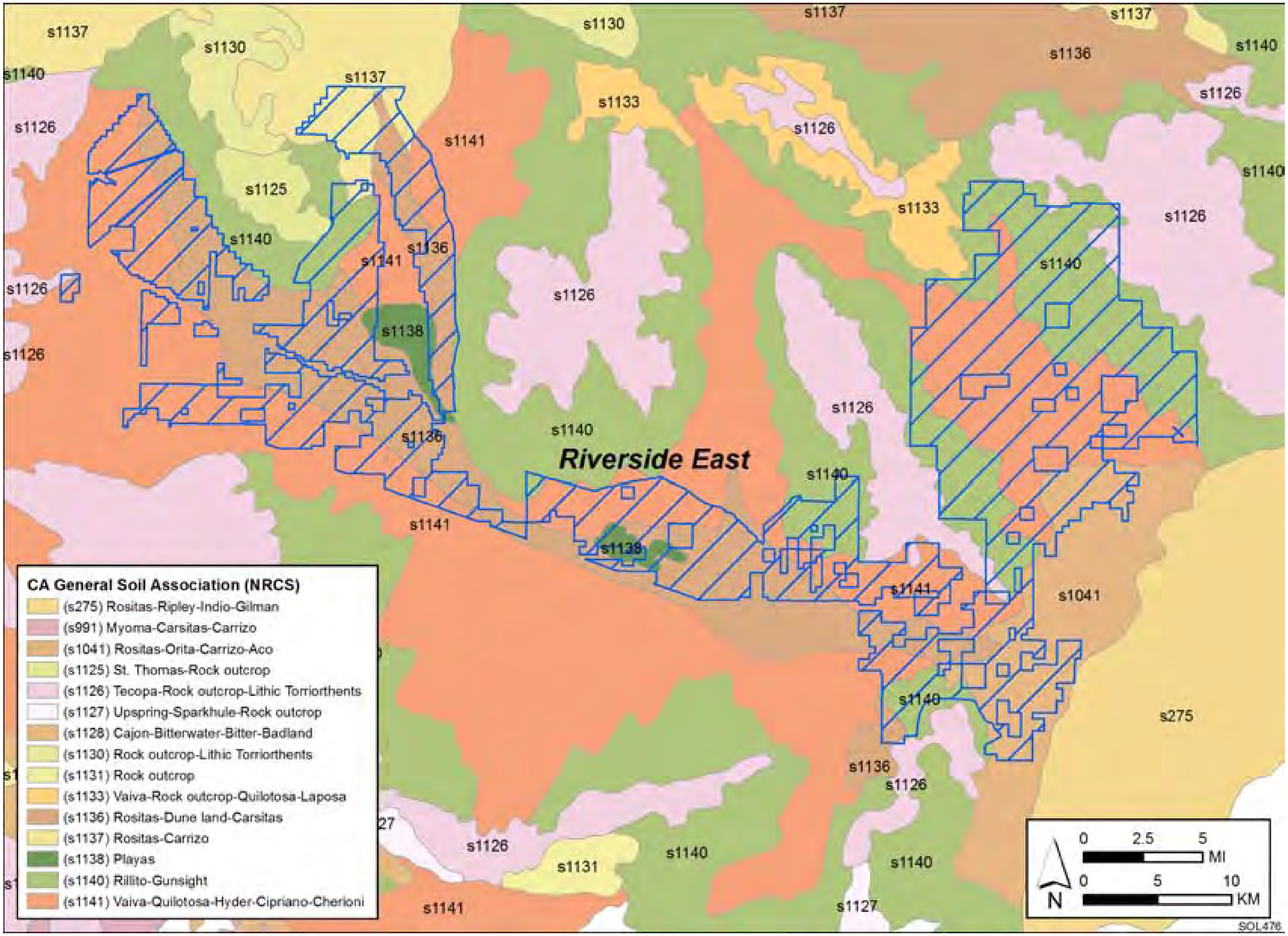

FIGURE 9.4.7.1-5 Soil Map for the Proposed Riverside East SEZ (Source: NRCS 2008)

TABLE 9.4.7.1-1 Summary of Soil Series within the Proposed Riverside East SEZ

Map Unit Symbol	Map Unit Name	Water Erosion Potential	Wind Erosion Potential	Description	Area in Acres[b] (% of SEZ)
s1136	Rositas-Dune land-Carsitas	–[a]	–[a]	*Rositas series* are gently sloping soils on dunes and sand sheets (gradients of 0 to 30%). Very deep and somewhat excessively drained with low surface runoff potential (high infiltration rate) and rapid permeability. Typically fine sand. *Dune land* soils are constantly shifting medium-grained sand deposited by wind blowing across the valley. Parent material consists of eolian sands. Little or no vegetation; very rapid permeability. *Carsitas series* are nearly level to strongly sloping soils on alluvial fans, moderately steep valley fills, and dissected alluvial fan remnants. Excessively drained with slow surface runoff (except during torrential events) and rapid permeability. Typically gravelly sand. Used for watershed and recreation; commercial source of sand and gravel.	48,237 (24)
s1141	Rositas-Orita-Carrizo-Aca	–	–	*Rositas series* described above. *Orita series* are nearly level to gently sloping soils on fan remnants and terraces (gradients of 0 to 2%). Parent material consists of alluvium from mixed sources. Very deep and well-drained soils with very low to medium surface runoff potential and moderate permeability. Well suited for cultivation if irrigated but not as rangeland. *Carrizo series* are gently sloping soils on floodplains, alluvial fans, fan piedmonts, and bolson floors (gradients of 0 to 15%). Parent material consists of alluvium from mixed sources. Very deep and excessively drained soils with negligible to very low surface runoff potential and rapid to very rapid permeability. Typically extremely gravelly sand. Aridic soil moisture regime.	14,564 (7)

TABLE 9.4.7.1-1 (Cont.)

Map Unit Symbol	Map Unit Name	Water Erosion Potential	Wind Erosion Potential	Description	Area in Acres[b] (% of SEZ)
s1137	Rositas-Carrizo	–	–	Used mainly as rangeland and wildlife habitat. *Aco series* are gently sloping soils on terraces above the flood plain (gradients of 0 to 8%). Parent material consists of alluvium from mixed sources. Very deep and well-drained to somewhat excessively drained soils with low to medium surface runoff potential and moderately rapid permeability. Typically sandy loam. Used for cropland if irrigated. *Rositas series* as described above. *Carrizo series* are gently sloping soils on floodplains, alluvial fans, fan piedmonts, and bolson floors (gradients of 0 to 15%). They are very deep, excessively drained soils formed in mixed alluvium. Negligible to very low surface runoff potential; rapid to very rapid permeability. Typically extremely gravelly sand. Aridic soil moisture regime. Used mainly as rangeland and wildlife habitat.	5,774 (3)
s1138	Playas	–	–	Very poorly drained soils formed in flats and closed basins; moderately to strongly saline. Medium surface runoff potential and low permeability.	2,741 (1)
s1126	Tecopa-Rock outcrop Lithic torriorthents	–	–	*Tecopa series* are sloping soils on low hills and low mountain side slopes (gradients of 15 to 75%). Very shallow and well-drained soils formed in residuum and colluvium weathered from metamorphic rocks with medium to rapid surface runoff and moderate permeability. Typically very gravelly sandy loam. Used mainly as desert rangeland. *Rock outcrop* occurs as low ridges or boulder piles and consists of variable rock types. Rapid surface runoff and barren of vegetation. *Lithic Torriorthents* are sloping soils on steep hill and mountain side slopes (gradients 15 to 60% or more) with rapid surface runoff. Typically very gravelly sand loam or loam.	2,168 (1)

[a] A dash indicates water and wind erosion potential not rated at the Soil Series taxonomic level.

[b] To convert acres to km^2, multiply by 0.004047.

Source: NRCS (2006); CEC (2010).

Palen and Ford Dry Lakes may not be suitable locations for construction since lakebed sediments are often saturated with shallow groundwater and likely collapsible. The lakes sit within low elevation areas and serve as sumps for drainage in the Palen and Chuckwalla Valleys.

9.4.7.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features were identified for soil resources at the proposed Riverside East SEZ. Implementing the programmatic design features described in Appendix A, Section A.2.2., as required under BLM's proposed Solar Energy Program, would reduce the potential for soil impacts during all project phases.

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9.4.8 Minerals (Fluids, Solids, and Geothermal Resources)

9.4.8.1 Affected Environment

Public land in the Riverside East SEZ was closed to locatable mineral entry in June 2009 pending the outcome of this solar energy PEIS. Currently, there are nine mill site claims within the SEZ (BLM and USFS 2010a) located in Township 4 South, Range 21 East, SBM, in Sections 22 and 27. The claims cover the southwest quarter of both sections.

There are no oil and gas leases within the proposed SEZ, although the area was largely leased at one time (BLM and USFS 2010a). There was also a geothermal lease in the area east of Desert Center, which is now closed (BLM and USFS 2010a) The area is still open for discretionary mineral leasing, including leasing for oil and gas and other leasable and saleable minerals.

9.4.8.2 Impacts

If the BLM identifies the area as an SEZ to be used for utility-scale solar development, it would continue to be closed to all incompatible forms of mineral development with the exception of the areas covered by existing mining claims. The existing claims represent prior existing rights that, if valid, would preclude solar energy development as long as they are in place. Development of solar resources in areas with mining claims could only occur if (1) the claims are abandoned, (2) the claims are demonstrated to not be valid and are vacated by the BLM, or (3) the claims are purchased by a solar developer. The latter two of these approaches could require considerable time, negotiation, and money to accomplish. Although they encumber only a small percentage of the SEZ, the mining claims represent an impediment to moving forward with planning solar development where they are located and are likely to prevent that development in the immediate future.

Since there are no other mining claims within the SEZ, it is assumed there would be no loss of locatable mineral production.

Since there are no current oil and gas leases within the SEZ, it is assumed there would be no impacts on these resources if the SEZ were developed for solar energy production. In addition, should any oil and gas resources be found, they could be accessible via directional drilling from outside of the SEZ.

Solar energy development of the SEZ would preclude future surface use of the site to produce geothermal energy, although geothermal resources, should any be found, might be accessed through directional drilling. Because of this option and the lack of current geothermal leases within the SEZ, solar energy development is anticipated to have no impact on development of geothermal resources.

If the area is identified as a solar energy development zone, some other mineral uses might be allowed on all or portions of the SEZ. For example, the sale of common minerals, such as sand, gravel, and mineral materials used for road construction, might take place in areas not directly developed for solar energy production.

9.4.8.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features were identified. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's proposed Solar Energy Program would provide adequate mitigation for some identified impacts.

9.4.9 Water Resources

9.4.9.1 Affected Environment

The proposed Riverside East SEZ is located within the Southern Mojave-Salton Sea subbasin of the California hydrologic region (USGS 2010a) and the Basin and Range physiographic province characterized by intermittent mountain ranges and desert valleys (Planert and Williams 1995). The proposed SEZ has surface elevations ranging between 450 and 1,000 ft (137 and 305 m) and contains several small alluvial fans between the surrounding mountains generating flow patterns toward Palen Lake and Ford Dry Lake, as well as a general drainage pattern from the northwest to the southeast toward the Colorado River (Figures 9.4.9.1-1 and 9.4.9.1-2). This region is located within the Mojave Desert, which is characterized by extreme daily temperature ranges with low precipitation and humidity (CDWR 2009). Arid conditions exist because of low rainfall (annual precipitation is between 4 and 6 in./yr [10 and 15 cm/yr])(CDWR 2003), as well as high pan evaporation rates (130 in./yr [330 cm/yr]) (Cowherd et al. 1988; WRCC 2010a).

9.4.9.1.1 Surface Waters (Including Drainages, Floodplains, and Wetlands)

There are no perennial streams located in the proposed Riverside East SEZ. Palen Lake and Ford Dry Lake are located in the western and central portions of the SEZ, respectively (Figure 9.4.9.1-1). Palen Lake is a wet playa having groundwater located near the surface and covering an area of 4,260 acres (17 km^2) with only 750 acres (3 km^2) within the boundaries of the SEZ. Ford Dry Lake is a dry lakebed covering 4,400 acres (18 km^2), most of which is within the SEZ boundaries. The primary surface water features within the proposed Riverside East SEZ are several ephemeral washes coming off the surrounding mountains. A reach of the CRA is located along the northwestern boundary of the SEZ with several levees along the base of the Eagle Mountains and the Coxcomb Mountains that channel runoff from the mountains to culvert crossings over the CRA and into the boundaries of the SEZ. The McCoy Wash drains the eastern slope of the McCoy Mountains and flows to the southeast across the eastern portion of the SEZ (Figure 9.4.9.1-2). Annual runoff estimates for the McCoy Wash are on the order of 800 ac-ft/yr (987,000 m^3/yr) (Metzger et al. 1973).

Flood hazards have not been identified (Zone D) for the region surrounding the proposed Riverside East SEZ (FEMA 2009). The CDWR awareness floodplain mapping initiative indicates that several areas of the proposed Riverside East SEZ are potentially within 100-year floodplains (CDWR 2010b). These potential floodplain areas are concentrated around the surrounding areas of Ford Dry Lake and Palen Lake, and the ephemeral washes draining the Eagle Mountains and Coxcomb Mountains (Figure 9.4.9.1-1), as well as the ephemeral washes that drain the McCoy Mountains and Little Maria Mountains that feed McCoy Wash (Figure 9.4.9.1-2). Intermittent flooding may occur along the many ephemeral washes within the proposed SEZ with potential for channel incision and sedimentation. Temporary ponding may occur in the low drainage areas near Palen Lake and Ford Dry Lake.

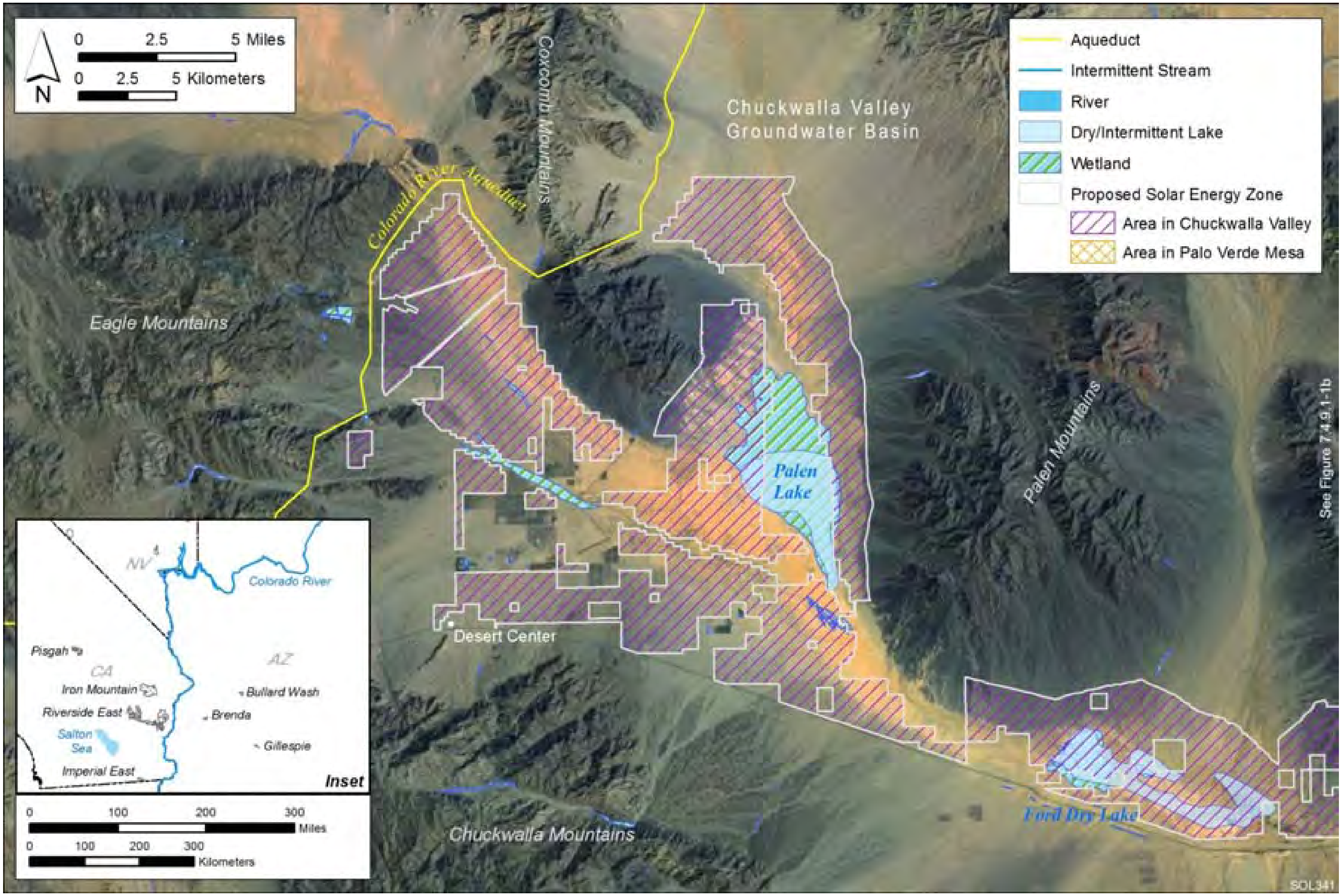

FIGURE 9.4.9.1-1 Surface Water Features near the Western Half of the Proposed Riverside East SEZ

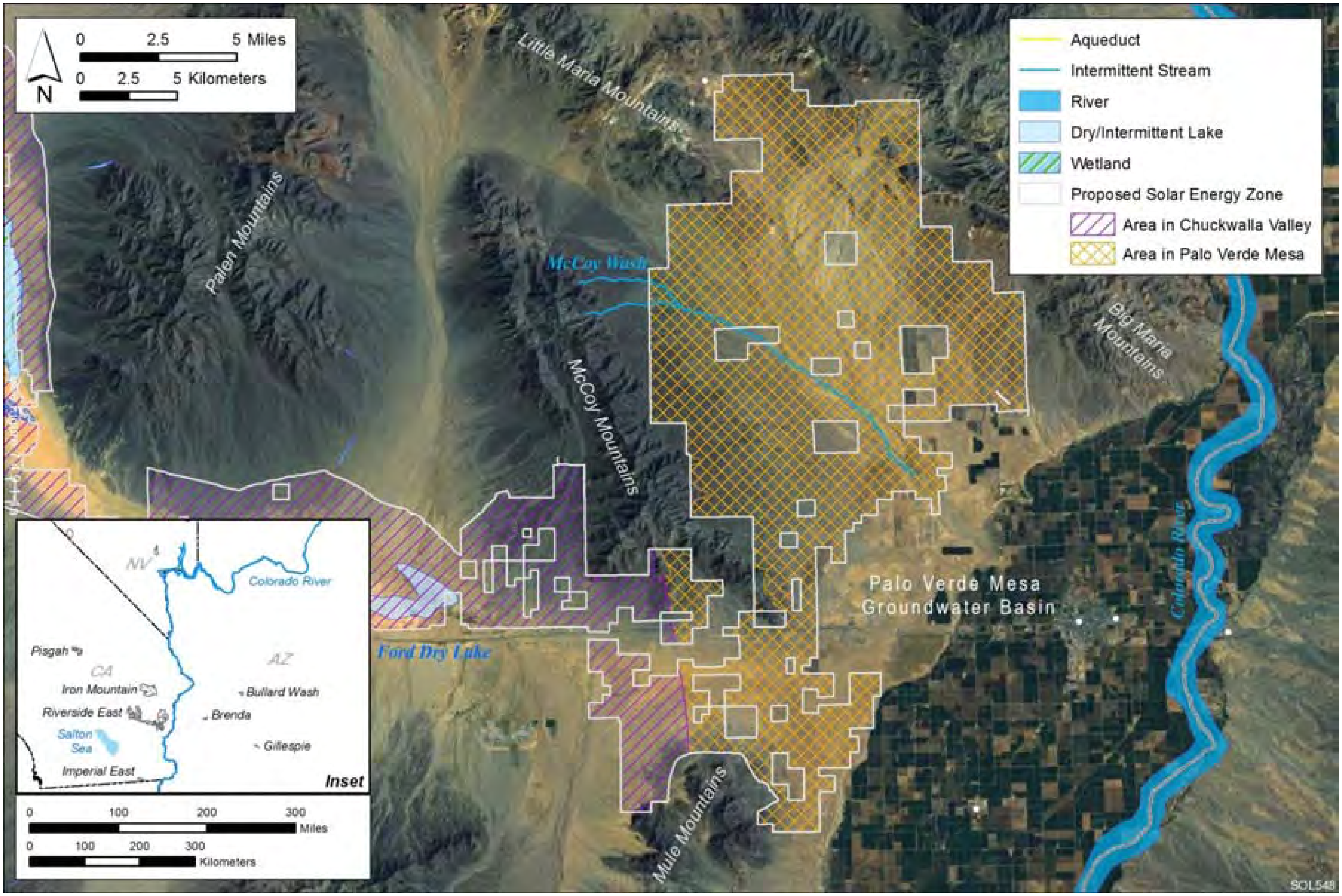

FIGURE 9.4.9.1-2 Surface Water Features near the Eastern Half of the Proposed Riverside East SEZ

Several small to large wetlands were identified in the western and central portions of the SEZ, according to the NWI (USFWS 2009). The largest wetland area is the lacustrine wetland that surrounds Palen Lake (Figure 9.4.9.1-1), which is intermittently flooded with unconsolidated shore sediments. Further information regarding the small wetlands near the proposed SEZ is given in Section 9.4.10.1.

9.4.9.1.2 Groundwater

The proposed Riverside East SEZ is located within two groundwater basins: Chuckwalla Valley and Palo Verde Mesa. The divide between these two groundwater basins is a surface drainage divide between the McCoy Mountains and the Mule Mountains, as well as a buried bedrock ridge located below the primary water-bearing aquifer (Wilson and Owen-Joyce 1994; CDWR 2003, groundwater basin numbers 7-5 and 7-39), so there are no restrictive structures between the two groundwater basins. The principal aquifer consists of alluvium and fanglomerate deposits on top of a metamorphic bedrock basement complex (CDWR 2003). The Quaternary age alluvium sediments consist of alluvial fan and river deposits of fine to coarse sands intermixed with layers of gravel, silt, and clay sediments. The late Tertiary age fanglomerate deposits are a part of the Bouse Formation consisting of alluvial fan and marine deposits of limestone interbedded with clays, silt and sand (Wilson and Owen-Joyce 1994). The total thickness of the principal aquifer is on the order of 1,200 ft (366 m) (CDWR 2003), and the alluvium layer thickness is on the order of 100 to 150 ft (30 to 46 m) in the region of the SEZ (Metzger et al. 1973).

Groundwater recharge in the Chuckwalla Valley is by subsurface underflow and from direct infiltration of precipitation runoff. Subsurface underflow is from the Pinto Valley and Cadiz Valley groundwater basins to the west of the Chuckwalla Valley. The natural groundwater flow pattern is from west to east across the Chuckwalla Valley toward the Colorado River. Estimates of natural recharge have not been quantified in the Chuckwalla Valley. Natural recharge is estimated to be 800 ac-ft/yr (987,000 m^3/yr) in the neighboring Palo Verde Mesa and the Cadiz Valley, which have similar climate and precipitation conditions (CDWR 2003). Recharge from precipitation runoff is not suspected to be significant given the limited precipitation in the region (Metzger et al. 1973). Discharge in the Chuckwalla Valley is primarily by evapotranspiration at Palen Lake and subsurface underflow to the Palo Verde Mesa; the evapotranspiration rate at Palen Lake is unknown, and the subsurface underflow is estimated to be 400 ac-ft/yr (493,000 m^3/yr) to Palo Verde Mesa (CDWR 2003). Groundwater withdrawal rates were 9,100 ac-ft/yr (11.2 million m^3/yr) in 1966 (CDWR 2003), and between 4,400 and 5,700 ac-ft/yr (5.4 million and 7.0 million m^3/yr) during dry and wet years occurring in the period 1998 to 2001 (CDWR 2005). The majority of groundwater withdrawals in the region of the proposed SEZ are for agricultural and domestic uses.

Groundwater surface elevations are routinely monitored in the Chuckwalla Valley and Palo Verde Mesa as a part of the methodology used to determine groundwater that is replenished by Colorado River water, as outlined in the 2006 consolidated decree of the U.S. Supreme Court (*Arizona v. California* 2006) (see Section 9.4.9.1.3 for further information). Depth to groundwater ranges between 80 and 270 ft (24 and 82 m) below the surface across the Chuckwalla Valley and into the Palo Verde Mesa (USGS 2010b). Groundwater surface elevations have remained steady for several decades (USGS 2010c, monitoring wells 334438115211101, 333939114411501). Groundwater well yields average 1,800 gpm (6,814 L/min) with a maximum of 3,900 gpm (14,760 L/min) in the Chuckwalla Valley. However, the majority of the groundwater extractions are clustered on the western and eastern edges of the valley around Desert Center and the Palo Verde Mesa. It is suspected that further groundwater development in this region may lead to declines in groundwater elevations (Metzger et al. 1973; Steinemann 1989). Transmissivity values for the principal aquifer have been reported to range from 13 to 94,000 ft^2/day (1.2 to 8,733 m^2/day) (Metzger et al. 1973).

TDS concentrations range from 274 to 12,300 mg/L in the Chuckwalla Valley and from 730 to 4,500 mg/L in the Palo Verde Mesa (CDWR 2003). The best water quality, in terms of low TDS values, comes from the western portion of the Chuckwalla Valley around Desert Center, where the average TDS is 2,100 mg/L; TDS values increase as the groundwater flows eastward towards the Colorado River (Steinemann 1989). In the region of Palen Lake, TDS values range between 2,960 and 4,370 mg/L (CDWR 2003). Additional concerns relating to groundwater quality are high concentrations of arsenic, selenium, fluoride, chloride, boron, sulfate, and TDS, which impair its use for domestic and agricultural applications in certain areas of the Chuckwalla Valley and Palo Verde Mesa (CDWR 2003).

9.4.9.1.3 Water Use and Water Rights Management

In 2005, water withdrawals from surface waters and groundwater in Riverside County were 1.4 million ac-ft/yr (1.7 billion m^3/yr), of which 74% came from surface waters and 26% from groundwater. The largest water use category was municipal and domestic supply, at 519,000 ac-ft/yr (640 million m^3/yr). However, the majority of this water is used in the larger cities located in the western portion of Riverside County. Agricultural water uses accounted for 874,000 ac-ft/yr (1.1 billion m^3/yr), and industrial water uses on the order of 7,000 ac-ft/yr (8.6 million m^3/yr) (Kenny et al. 2009). The primary water use in the eastern portion of Riverside County relevant to the proposed Riverside East SEZ is for agriculture, representing 59% to 77% of total groundwater withdrawals during the dry and wet years, respectively, in the period 1998 to 2001 (CDWR 2005).

To manage water resources, California uses a “plural” system, which consists of a mixture of riparian and prior appropriation doctrines for surface waters, a separate doctrine for groundwater, and pueblo rights (BLM 2001). Several agencies are involved with the management of California’s water resources, including federal, state, local, and water/irrigation districts. For example, water rights and water quality are managed by the State Water Board, while the CDWR manages water conveyance, infrastructure, and flood management (CDWR 2009). Surface water appropriations for nonriparian rights begin with a permit application to the State Water Board and a review process that examines the application’s beneficial use, pollution potential, and water quantity availability; the permitting, review, and licensing procedure should not take more than 6 months to complete unless the application is protested (BLM 2001).

Groundwater management in California is primarily implemented at the local level of government through local agencies or ordinances; it can also be subject to court adjudications. State statute provides authority and revenue mechanisms to several types of local agencies to provide water for beneficial uses, as well as to manage withdrawals in order to prevent overdraft[2] of the aquifers. Local ordinances (typically at the county level) can also be used to manage groundwater resources and have been adopted in 27 counties in California. Many of these local groundwater ordinances are focused on controlling water exports out of the basin through permitting processes. Court adjudications are the strongest form of groundwater management used in California and often result in the creation of a court-appointed "watermaster" agency to manage withdrawals for all users to ensure that the court-determined safe yield[3] is maintained (CDWR 2003).

The most significant water management issue relating to the proposed Riverside East SEZ is the assemblage of compacts, federal laws, court decrees, and contracts that form the "Law of the River," which pertains to the management of the Colorado River. The key aspects of the Law of the River relevant to the proposed SEZ are as follows (BOR 2008):

- 1922 Colorado River Compact, which defines the Upper and Lower Colorado River Basins and allots to each basin 7.5 million ac-ft/yr (9.3 billion m^3/yr) for beneficial use;

- 1928 Boulder Canyon Project Act, which grants California 4.4 million ac-ft/yr (9.3 billion m^3/yr) of the lower Colorado River Basin's allotment;

- 1931 California Seven Party Agreement, which prioritizes California's allotment among local water management entities; and

- 1964 U.S. Supreme Court decision, along with the Consolidation Decree of 2006, which provides a single reference to the 1964 decision (*Arizona v. California* 2006).

In accordance with the Law of the River, the USGS developed a method for identifying groundwater wells outside of the Colorado River's floodplain, where groundwater is replenished by Colorado River water. This method is known as the Accounting Surface, and it establishes a surface of static groundwater elevations, below which water is accounted for as Colorado River water and above which water is accounted for as local tributary replenished water (Wilson and Owen-Joyce 1994; Wiele et al. 2008). Groundwater below the Accounting Surface is subject to water management by the Law of the River, which is administered by the BOR (Wilson and Owen-Joyce 1994), and water above the Accounting Surface is subject to water management by state and local entities.

[2] Groundwater overdraft is the condition in which water extractions from an aquifer exceed recharge processes in such excess as to cause substantial and sustained decreases in groundwater flows and groundwater elevations.

[3] Safe yield is the amount of groundwater that can be withdrawn from a groundwater basin over a period of time without exceeding the long-term recharge of the basin or unreasonably affecting the basin's physical and chemical integrity.

The Colorado River Accounting Surface is at an elevation between 238 and 240 ft (72.5 and 73 m) for most of the Chuckwalla Valley and Palo Verde Mesa area (Wiele et al. 2008). From west to east across the Chuckwalla Valley and into the Palo Verde Mesa, static groundwater elevations are approximately 488 ft (149 m) near Desert Center, 288 ft (88 m) near Palen Lake, and 245 ft (75 m) near the split between the two groundwater basins (USGS 2010b). Groundwater above the Accounting Surface is subject to State of California laws, because there are no local management entities in this area. Landowners in California may withdraw groundwater for beneficial use without approval from the State Water Board in regions where no local-level management or court adjudication takes precedence, so long as their use does not impair the availability of neighboring water rights (CDWR 2010a).

Approximately 3% of the proposed SEZ is located in the boundaries of the Palo Verde Irrigation District (PVID) along the very eastern edge of the SEZ. The PVID manages water rights for the Palo Verde Valley and portions of the Palo Verde Mesa. The PVID shares a priority right to develop up to 3.85 million ac-ft/yr (4.75 billion m^3/yr) with the Yuma Project and the Imperial Irrigation District according to the California Seven Party Agreement of 1931. The majority of the consumptive use of water in the Palo Verde Valley is irrigation with water supplied by surface water diversions, and any groundwater development on the Palo Verde Mesa in the PVID boundaries would have to make prior arrangements with the PVID. Additionally, the MWD has an indirect stake regarding consumptive water use in the PVID boundaries, because in 2004 the MWD and PVID started a 35-year agreement in 2004 for land fallowing within the PVID boundaries in order to supply MWD with Colorado River water (MWD 2007).

Water management issues pertaining to the CRA are described in Section 9.2.9.1.3.

9.4.9.2 Impacts

Potential impacts on water resources related to utility-scale solar energy development include direct and indirect impacts on surface waters and groundwater. Direct impacts occur at the place of origin and at the time of the proposed activity, while indirect impacts occur away from the place of origin or later in time. Impacts on water resources considered in this analysis are the result of land disturbance activities (construction, final developed site plan, as well as off-site activities such as road and transmission line construction) and water use requirements for solar energy technologies that take place during the four project phases: site characterization, construction, operations, and decommissioning/reclamation. Both land disturbance and consumptive water use activities can affect groundwater and surface water flows, cause drawdown of groundwater surface elevations, modify natural drainage pathways, obstruct natural recharge zones, and alter surface water-wetland-groundwater connectivity. Water quality also can be degraded through the generation of wastewater, chemical spills, increased erosion and sedimentation, and increased salinity (e.g., by the excessive withdrawal from aquifers).

9.4.9.2.1 Land Disturbance Impacts on Water Resources

Impacts related to land disturbance activities are common to all utility-scale solar energy facilities and are described in more detail for the four phases of development in Section 5.9.1; these impacts will be minimized through the implementation of programmatic design features described in Appendix A, Section A.2.2. In addition to the hydrologic evaluation (including identifying 100-year floodplains and jurisdictional waters) described in the design features, coordination and permitting with the CDFG would be needed for any proposed alterations of surface water features (both perennial and ephemeral) in accordance with the Lake and Streambed Alteration Program (CDFG 2010a). Siting of solar energy facilities near Palen Lake and Ford Dry Lake (Figure 9.4.9.1-1) could disrupt the natural drainage patterns to these receiving bodies, resulting in erosion and sedimentation issues. Additional concerns of land disturbance in the vicinity of Palen Lake are associated with the surrounding wetland habitat and groundwater recharge/discharge process, which could be adversely affected by alterations to natural drainage patterns. The McCoy Wash represents a significant surface drainage across the eastern portion of the SEZ (Figure 9.4.9.1-2) and a large portion of its watershed is suspected to be within a 100-year floodplain according to CDWR awareness floodplain maps (CDWR 2010b). Several smaller washes feed this incised channel, so land disturbance in the vicinity of McCoy Wash should be minimized in order to prevent further channel incision, erosion, and sedimentation impacts.

9.4.9.2.2 Water Use Requirements for Solar Energy Technologies

Analysis Assumptions

A detailed description of the water use assumptions for the four utility-scale solar energy technologies (parabolic trough, power tower, dish engine, and PV systems) is presented in Appendix M. Assumptions regarding water use calculations specific to the proposed Riverside East SEZ are as follows:

- On the basis of a total area of greater than 30,000 acres (121 km^2), it is assumed that three solar projects would be constructed during the peak construction year;

- Water needed for making concrete would come from an off-site source;

- The maximum land disturbance for an individual solar facility during the peak construction year is assumed to be 3,000 acres (12 km^2);

- Assumptions on individual facility size and land requirements (Appendix M), along with the assumed number of projects and maximum allowable land disturbance, result in the potential to disturb up to 4% of the total area of the proposed SEZ;

- Water use requirements for hybrid cooling systems are assumed to be on the same order of magnitude as those using dry cooling (see Section 5.9.2.1); and

- Water from the CRA is assumed to be unavailable to solar energy facilities (see Section 9.2.9.1.3 and Section 9.2.9.2.2 for further details).

Site Characterization

During site characterization, water would be used mainly for controlling fugitive dust and supplying potable water for the workforce. Impacts on water resources during this phase of development are expected to be negligible, because activities would be limited in area, extent, and duration; water needs could be met by trucking water in from an off-site source.

Construction

During construction, water would be used mainly for fugitive dust control and the workforce potable water supply. Because there are no perennial surface water bodies on the proposed Riverside East SEZ, the water requirements for construction activities could be met by either trucking water to the sites or by using on-site groundwater resources. TDS levels in groundwater used for a potable supply must be less than 1,500 mg/L and are recommended to be less than 500 mg/L to meet secondary maximum contaminant levels (California Code Title 22, Article 16, Section 64449). Given the potential for nonpotable TDS values in groundwater of the Chuckwalla Valley and the Palo Verde Mesa, workforce water supplies may have to be brought in from off-site.

Water requirements for dust suppression and potable water supply during construction, shown in Table 9.4.9.2-1, could be as high as 6,813 ac-ft (8.4 million m^3). Groundwater wells would have to yield an estimated 2,896 to 4,221 gpm (10,963 to 15,978 L/min) to meet the estimated construction water requirements. These yields are on the order of large municipal and agriculture production wells (Harter 2003), so multiple wells may be needed to obtain the water requirements. In addition, up to 222 ac-ft (273,800 m^3) of sanitary wastewater generated would need to be treated either on-site or sent to an off-site facility.

The total water use requirements for the peak construction year, listed in Table 9.4.9.2-1, are on the same order of magnitude as the current groundwater withdrawals in the Chuckwalla Valley, as described in Section 9.4.9.1.2. Under the current conditions of groundwater extractions, groundwater surface elevations have remained steady over time. Groundwater withdrawals for solar energy development during the peak construction year could essentially double the current groundwater withdrawal rate for the region, which would likely cause drawdown of groundwater surface elevations and potentially lead to land subsidence issues. Further characterization of the aquifer properties, including pumping tests, would need to be performed during the site characterization phase to better determine the storage capacity and safe yield of the aquifer.

TABLE 9.4.9.2-1 Estimated Water Requirements during the Peak Construction Year for the Proposed Riverside East SEZ

Activity	Parabolic Trough	Power Tower	Dish Engine	PV
Water use requirements[a]				
Fugitive dust control (ac-ft)[b,c]	4,452	6,678	6,678	6,678
Potable supply for workforce (ac-ft)	222	135	56	28
Total water use requirements (ac-ft)	4,674	6,813	6,734	6,706
Wastewater generated				
Sanitary wastewater (ac-ft)	222	135	56	28

[a] Assumptions of water use for fugitive dust control, potable supply for workforce, and wastewater generation are presented in Appendix M.

[b] Fugitive dust control estimation assumes a local pan evaporation rate of 130 in./yr (330 cm/yr) (Cowherd et al. 1988; WRCC 2010a).

[c] To convert ac-ft to m^3, multiply by 1,234.

Operations

During operations, water would be required for mirror/panel washing, the workforce potable water supply, and cooling (parabolic trough and power tower only) (Table 9.4.9.2-2). Water needs for cooling are a function of the type of cooling used (dry, wet, hybrid). Further refinements to water requirements for cooling would result from the percentage of operational time for the option employed (30% to 60% range assumed) and the power of the system. The differences between the water requirements reported in Table 9.4.9.2-2 for the parabolic trough and power tower technologies are attributable to the assumptions of acreage per megawatt. As a result, the water usage for the more energy-dense parabolic trough technology is estimated to be almost twice as large as that for power tower technology.

At full build-out capacity, water needs for mirror/panel washing are estimated to range from 902 to 16,232 ac-ft/yr (1.1 million to 20.0 million m^3/yr) and for the workforce potable water supply, from 20 to 455 ac-ft/yr (24,700 to 561,200 m^3/yr). As mentioned previously, TDS values in a potable water supply must be lower than 1,500 mg/L for short durations and less than 500 mg/L for prolonged use to meet California drinking water standards (*California Code*, Title 22, Article 16, Section 64449). Because of the high TDS concentrations that exist near the SEZ, water treatment may be required for the workforce potable water supply. The maximum total water usage during operation at full build-out capacity is estimated to be greatest for those technologies using the wet-cooling option, as high as 487,406 ac-ft/yr (601 million m^3/yr). Water usage for dry-cooling systems would be as high as 49,150 ac-ft/yr (60.6 million m^3/yr), approximately a factor of 10 times less than that for the wet-cooling option. Noncooled technologies, dish engine and PV systems, require substantially less water at full build-out capacity at 9,220 ac-ft/yr (11.4 million m^3/yr) and 922 ac-ft/yr (1.1 million m^3/yr), respectively (Table 9.4.9.2-2). Operations would produce up to 455 ac-ft/yr (561,200 m^3/yr) of sanitary

TABLE 9.4.9.2-2 Estimated Water Requirements during Operations at Full Build-Out Capacity at the Proposed Riverside East SEZ

Activity	Parabolic Trough	Power Tower	Dish Engine	PV
Full build-out capacity (MW)[a,b]	32,463	18,035	18,035	18,035
Water use requirements				
Mirror/panel washing (ac-ft/yr)[c,d]	16,232	9,018	9,018	902
Potable supply for workforce (ac-ft/yr)	455	202	202	20
Dry-cooling (ac-ft/yr)[e]	6,493–32,463	3,607–18,035	NA[f]	NA
Wet-cooling (ac-ft/yr)[e]	146,085–470,719	81,158–261,510	NA	NA
Total water use requirements				
Noncooled technologies (ac-ft/yr)	NA	NA	9,220	922
Dry-cooled technologies (ac-ft/yr)	23,180–49,150	12,827–27,255	NA	NA
Wet-cooled technologies (ac-ft/yr)	162,772–487,406	90,378-270,730	NA	NA
Wastewater generated				
Blowdown (ac-ft/yr)[g]	9,222	5,123	NA	NA
Sanitary wastewater (ac-ft/yr)	455	202	202	20

[a] Land area for parabolic trough was estimated at 5 acres/MW (0.02 km^2/MW); land area for power tower, dish engine, and PV technologies was estimated at 9 acres/MW (0.04 km^2/MW).

[b] Water needs are linearly related to power. Water usage for any other size project can be estimated by using multipliers provided in Table M.9-2 (Appendix M).

[c] Value assumes a usage rate of 0.5 ac-ft/yr/MW for mirror washing for parabolic trough, power tower, and dish engine technologies and a rate of 0.05 ac-ft/yr/MW for panel washing for PV systems.

[d] To convert ac-ft to m^3, multiply by 1,234.

[e] Dry-cooling value assumes 0.2 to 1.0 ac ft/yr per MW and wet-cooling value assumes 4.5 to 14.5 ac ft/yr per MW (range in these values represents 30 and 60% operating times) (DOE 2009).

[f] NA = not applicable.

[g] Value scaled from 250-MW Beacon Solar project with an annual discharge of 44 gpm (167 L/min) (AECOM 2009c). Blowdown estimates are relevant to wet cooling only.

wastewater. In addition, for wet-cooled technologies, 5,123 to 9,222 ac-ft/yr (6.3 million to 11.4 million m^3/yr) of cooling system blowdown water would need to be treated either on- or off-site. Any on-site treatment of wastewater would have to ensure that treatment ponds are effectively lined in order to prevent any groundwater contamination.

Groundwater is the primary water resource available for solar energy development at the proposed Riverside East SEZ. The current estimates of recharge and discharge processes in the Chuckwalla Valley and Palo Verde Mesa groundwater basin suggest that the groundwater aquifer is near a condition of equilibrium, as indicated by steady groundwater surface elevations and little development in the Chuckwalla Valley. The highest groundwater extraction rate in the Chuckwalla Valley was reported to be 9,100 ac-ft/yr (11.2 million m^3/yr) in 1966. Based on the limited information on groundwater aquifer characteristics, this groundwater extraction rate serves as an estimate of the maximum groundwater withdrawal rate that would likely not induce drawdown of groundwater surface elevations. However, further characterization of the groundwater resources in the Chuckwalla Valley is needed in order to fully quantify the safe yield of groundwater from this basin. Using the maximum historical groundwater withdrawal as a guide for assessing available water resources, only dish engine and PV systems would be feasible for the full build-out scenario of the proposed Riverside East SEZ. Power tower technologies at the lower operational times (30%) may be feasible as well. Technologies using wet-cooling have water requirement estimates that are a factor of 10 to 80 times greater than the maximum historical groundwater extraction rate for the region. Wet-cooled facilities would most likely cause significant drawdown of the groundwater surface elevations, so the use of wet-cooling technologies is not feasible for the proposed Riverside East SEZ.

The drawdown of groundwater surface elevations can generate impacts on the natural hydrology, as well as on ecosystem processes. Additional constraints affecting the region of the proposed Riverside East SEZ are the issues relating to the Colorado River Accounting Surface and the laws and management practices associated with the Law of the River, as described in Section 9.4.9.1.3. Current groundwater levels are on the order of 240 ft (73 m) above the Accounting Surface near Desert Center, but these levels above the Accounting Surface quickly drop to about 40 ft (12 m) near Palen Lake and 5 ft (1.5 m) near the Palo Verde Mesa. Groundwater below the Colorado River Accounting Surface is not available for solar energy development, because it is accounted for as Colorado River water, which is fully allocated by the treaties, compacts, and court decisions that make up the Law of the River.

Decommissioning/Reclamation

During decommissioning/reclamation, all surface structures associated with the solar project would be dismantled, and the site reclaimed to its preconstruction state. Activities and water needs during this phase would be similar to those during the construction phase (dust suppression and workforce potable supply) and may also include water to establish vegetation in some areas. However, the total volume of water needed is expected to be less. Because quantities of water needed during the decommissioning/reclamation phase would be less than those for construction, impacts on surface and groundwater resources also would be less.

9.4.9.2.3 Off-Site Impacts: Roads and Transmission Lines

Impacts associated with the construction of roads and transmission lines primarily deal with water use demands for construction, water quality concerns relating to potential chemical spills, and land disturbance effects on the natural hydrology. The proposed Riverside East SEZ is located adjacent to existing roads and transmission lines, as described in Section 9.4.1.2, so it is assumed that no additional construction outside of the SEZ would be required and there would be no impacts.

9.4.9.2.4 Summary of Impacts on Water Resources

The impacts on water resources associated with developing solar energy at the proposed Riverside East SEZ are associated with land disturbance effects on the natural hydrology, water quality concerns, and water use requirements for the various solar energy technologies. Land disturbance activities can cause localized erosion and sedimentation issues, as well as alter groundwater recharge and discharge processes. The impacts of land disturbance are of particular concern in the areas near Palen Lake, Ford Dry Lake, and the McCoy Wash. Palen Lake is a drainage outlet for several washes coming off the Coxcomb Mountains and the Palen Mountains, as well as a significant groundwater discharge point with shallow groundwater levels supporting wetland vegetation. Ford Dry Lake is a drainage outlet for washes coming off the Palen Mountains and the McCoy Mountains. McCoy Wash is a large, incised drainage that conveys significant flows during rainfall events, and much of its watershed is located within a suspected 100-year floodplain. Water quality concerns specific to the proposed SEZ deal with contamination of groundwater through surface spills and with potable water supplies meeting California drinking water standards, for which TDS values exceed standards in certain areas of the SEZ.

Impacts from water use requirements vary depending on the type of solar technology built and, for technologies using cooling systems, the type of cooling (wet, dry, or hybrid) used. Groundwater is the primary water resource available to solar energy facilities in the proposed Riverside East SEZ; however, aquifer characteristics and the region's safe yield are not fully quantified. The estimates of groundwater recharge, discharge, and underflow from adjacent basins and historical data on groundwater extractions and groundwater surface elevations suggest that there may not be groundwater available to support the water-intensive technologies, such as those using wet cooling. An additional constraint on groundwater development in the proposed Riverside East SEZ is the water rights issue related to the Colorado River Accounting Surface, which defines a groundwater elevation below which the groundwater is accounted for as fully allocated Colorado River water.

The estimated values of water requirements for the solar energy technologies are a function of the full build-out capacity of the proposed SEZ. Full build-out of the large area of the proposed Riverside East SEZ has the theoretical potential to generate 18,035 to 32,463 MW, but would require very large water supplies for water-intensive technologies (Table 9.4.9.2-2). For the purpose of evaluating a more realistic build-out scenario reflecting the available water supplies, an estimate of the maximum power capacity for each technology was made assuming a value for available groundwater resources in the Chuckwalla Valley. The maximum historical groundwater withdrawal rate was 9,100 ac-ft/yr (11.2 million m^3/yr) in 1966, which did not result in significant overdraft conditions. Using this historical withdrawal rate as an estimate of the available groundwater resources, wet-cooling technologies could potentially support 2 to 10% of the full build-out power capacity, while dry cooling could potentially support only 19 to 71%. This analysis of the potential power production capacity based on limited water resources should serve as an estimate only. Further characterization of the groundwater safe-yield for the Chuckwalla Valley and Palo Verde Mesa basins would be needed prior to the evaluation of impacts associated with project-specific groundwater withdrawals. Additionally, any proposed project-specific groundwater withdrawals will need to be analyzed with respect to drawdown effects and the Colorado River Accounting Surface. While there is limited information on groundwater resources at the proposed Riverside East SEZ, this analysis suggests that wet-cooling technologies would be unfeasible and that substantial water conservation strategies would be needed for dry cooled and dish engine. The relatively small quantities of water estimated to support PV systems for the full build-out scenario suggest that this would be the preferred technology for large-scale solar energy production at the proposed Riverside East SEZ.

9.4.9.3 SEZ-Specific Design Features and Design Feature Effectiveness

The program for solar energy development on BLM-administered lands will require the programmatic design features given in Appendix A, Section A.2.2, to be implemented, thus mitigating some impacts on water resources. Programmatic design features would focus on coordinating with federal, state, and local agencies that regulate the use of water resources to meet the requirements of permits and approvals needed to obtain water for development, and conducting hydrological studies to characterize the aquifer from which groundwater would be obtained (including drawdown effects, if a new point of diversion is created). The greatest consideration for mitigating water impacts would be in the selection of solar technologies. The mitigation of impacts would be best achieved by selecting technologies with low water demands.

Proposed design features specific to the proposed Riverside East SEZ are as follows:

- Wet-cooling options would not be feasible; other technologies should incorporate water conservation measures.

- Land disturbance activities should avoid impacts to the extent possible near the regions surrounding Palen Lake, Ford Dry Lake, and McCoy Wash.

- During site characterization, hydrologic investigations would need to identify 100-year floodplains and potential jurisdictional water bodies subject to Clean Water Act Section 404 permitting. Siting of solar facilities and construction activities should avoid areas identified as within a 100-year floodplain.

- During site characterization, coordination and permitting with CDFG regarding California's Lake and Streambed Alteration Program would be required for any proposed alterations to surface water features (both perennial and ephemeral).

- Groundwater withdrawals should comply with rules and regulations set forth by the PVID for the portions of the SEZ located within PVID boundaries.

- The use of groundwater in the Chuckwalla Valley and Palo Verde Mesa should be planned for and monitored in cooperation with the BOR and the USGS in reference to the Colorado River Accounting Surface and the rules set forth in the Law of the River.

- Groundwater monitoring and production wells should be constructed in accordance with standards set forth by the State of California (CDWR 1991) and Riverside County.

- Stormwater management plans and BMPs should comply with standards developed by the California Stormwater Quality Association (CASQA 2003).

- Water for potable uses would have to meet or be treated to meet water quality standards in the California Safe Drinking Water Act (*California Health and Safety Code*, Chapter 4).

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9.4.10 Vegetation

This section addresses vegetation that could occur or is known to occur within the potentially affected area of the proposed Riverside East SEZ. The affected area considered in this assessment includes the areas of direct and indirect effects. The area of direct effects was defined as the area that would be physically modified during project development (i.e., where ground-disturbing activities would occur) and included only the SEZ. The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary where ground-disturbing activities would not occur but that could be indirectly affected by activities in the area of direct effect. No area of direct or indirect effects was assumed for new transmission lines or access roads because they are not expected to be needed for facilities on the proposed Riverside East SEZ due to the proximity of an existing transmission line and state highway.

Indirect effects considered in the assessment included effects from surface runoff, dust, and accidental spills from the SEZ, but do not include ground-disturbing activities. The potential degree of impacts from indirect effects would decrease with increasing distance from the SEZ. This area of indirect effect was identified on the basis of professional judgment and was considered sufficiently large to bound the area that would potentially be subject to indirect effects. The affected area is the area bounded by the areas of direct and indirect effects. These areas are defined and the impact assessment approach is described in Appendix M.

9.4.10.1 Affected Environment

The proposed Riverside East SEZ is located in a transitional area that includes many species associated with the Mojave and Sonoran Deserts. Most of the SEZ is located within the Sonoran Basin and Range Level III ecoregion (EPA 2007), which supports creosotebush (*Larrea tridentata)*-white bur sage (*Ambrosia dumosa*) plant communities with large areas of palo verde (*Cercidium microphyllum*)-cactus shrub and saguaro cactus (*Carnegiea gigantea*) communities (EPA 2002). The dominant species of the Lower Colorado River Valley subdivision of the Sonoran Desert are primarily creosotebush, white bursage, and all-scale (*Atriplex polycarpa*), with big galleta (*Pleuraphis rigida*), Palmer alkali heath (*Frankenia palmeri*), brittlebush (*Encelia farinosa*), and western honey mesquite (*Prosopis glandulosa* var. *torreyana*) dominant in some areas (Turner and Brown 1994). Larger drainageways and washes support species of small trees and shrubs that may also occur in adjacent areas, such as western honey mesquite, ironwood (*Olneya tesota*), and blue palo verde (*Cercidium floridum*), as well as species such as smoketree (*Psorothamnus spinosa*), which are mostly restricted to drainageways. Shrub species found in minor drainages include cat-claw acacia (*Acacia greggii*), burrobrush (*Hymenoclea salsola* var. *pentalepis*), Anderson thornbush (*Lycium andersonii*), and desert broom (*Baccharis sarothroides*). Annual precipitation in the Sonoran Desert occurs in winter and summer (Turner and Brown 1994) and is very low in the area of the SEZ, averaging about 3.5 in. (89.7 mm) at the Blythe Airport (see Section 9.4.13).

The western portion of the SEZ lies within the Mojave Basin and Range Level III ecoregion, which is characterized by broad basins and scattered mountains. The boundary between the Sonoran and Mojave Deserts represents a transitional area that includes many species associated with both deserts. Communities of sparse, scattered shrubs and grasses including creosotebush, white bursage (*Ambrosia dumosa*), and big galleta grass (*Pleuraphis rigida*) occur in basins; Joshua tree (*Yucca brevifolia*), other Yucca species, and cacti occur on arid footslopes; woodland and shrubland communities occur on mountain slopes, ridges, and hills (Bryce et al. 2003). Creosote bush, all-scale (*Atriplex polycarpa*), brittlebush (*Encelia farinosa*), desert holly (*Atriplex hymenelytra*), white burrobrush (*Hymenoclea salsola*), shadscale (*Atriplex confertifolia*), blackbrush (*Coleogyne ramosissima*), and Joshua tree (*Yucca brevifolia*) are dominant species within the Mojave desertscrub biome (Turner 1994).

Land cover types described and mapped under CAReGAP (NatureServe 2010) were used to evaluate plant communities in and near the SEZ. Each cover type encompasses a range of similar plant communities. Land cover types that occur within the potentially affected area of the proposed Riverside East SEZ are shown in Figure 9.4.10.1-1. Table 9.4.10.1-1 provides the surface area of each cover type within the potentially affected area.

Lands within the Riverside East SEZ are classified primarily as Sonora-Mojave Creosotebush-White Bursage Desert Scrub. Additional cover types within the SEZ are given in Table 9.4.10.2-1. Creosotebush was observed to be the dominant species over much of the SEZ in August 2009; associated shrubs included brittlebush, white burrobrush, and desert holly. Western honey mesquite occurs in sand dune areas. Biological soil crusts are present in some areas. Characteristic Sonoran Desert species observed on the SEZ include ironwood, western honey mesquite, smoketree, and blue palo verde. Cacti species observed within the SEZ were barrel cactus (*Ferocactus cylindraceus*) and cholla (*Opuntia* sp.). Community types present on the SEZ that are considered sensitive by the California Resources Agency (BLM 2002a,b) include desert dry wash woodlands, desert chenopod scrub/mixed salt desert scrub, sand dune communities, and playa communities. Plant communities that are dependent on groundwater include mesquite bosque and bush seep-weed (*Suaeda moquinii*) communities (BLM and CEC 2010b), both primarily associated with Palen Lake, located in the western portion of the SEZ, where groundwater is relatively shallow (see Section 9.4.9).

The area surrounding the SEZ, within 5 mi (8 km), includes 16 cover types, which are listed in Table 9.4.10.1-1. The predominant cover types are Sonora-Mojave Creosotebush-White Bursage Desert Scrub, North American Warm Desert Volcanic Rockland, and North American Warm Desert Bedrock Cliff and Outcrop.

Wetlands mapped by the NWI that occur within the proposed Riverside East SEZ and within the 5-mi (8-km) area of indirect effects are shown in Figure 9.4.10.1-2 and summarized in Table 9.4.10.1-2. NWI maps are produced from high-altitude imagery and are subject to uncertainties inherent in image interpretation (USFWS 2009). Thirty-seven wetlands are located entirely or in part within the SEZ, primarily in the central and western portions of the SEZ, with a total of 3,807 acres (15.4 km^2) occurring within the boundaries of the SEZ. These wetlands are all intermittently flooded, indicating that surface water is usually absent but may be present for variable periods. Six wetlands are classified as lacustrine unconsolidated shore wetlands, with a total of 3,517 acres (14.2 km^2) mapped within the SEZ. Unconsolidated shore wetlands have a sparse vegetation cover. The lacustrine wetlands are primarily associated with Palen Lake and

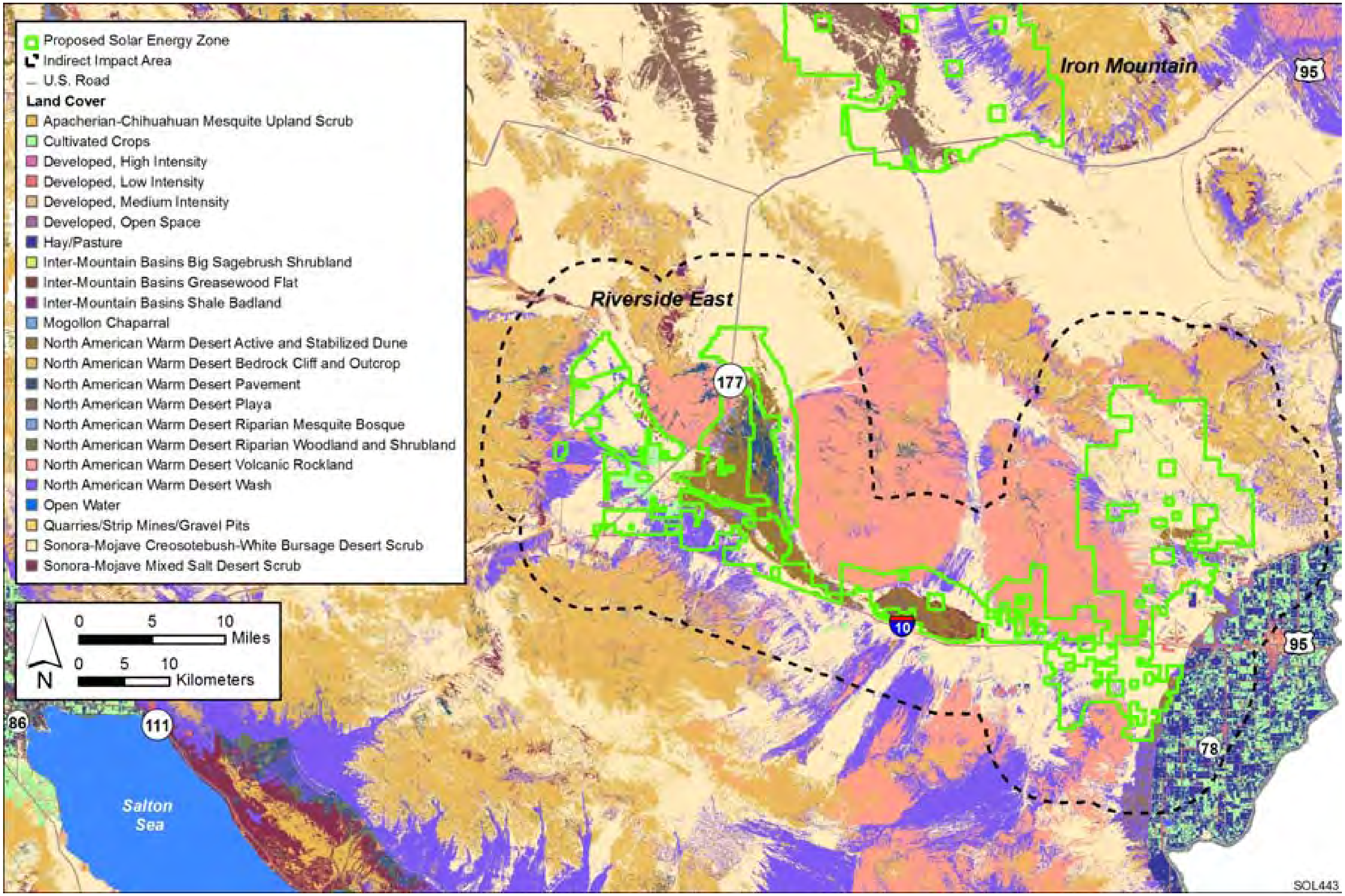

FIGURE 9.4.10.1-1 Land Cover Types within the Proposed Riverside East SEZ (Source: NatureServe 2010)

TABLE 9.4.10.1-1 Land Cover Types within the Potentially Affected Area of the Proposed Riverside East SEZ and Potential Impacts

Land Cover Type[a]	Area of Cover Type Affected (acres)[b] Within SEZ[c] (Direct Effects)	Area of Cover Type Affected (acres)[b] Outside SEZ[d] (Indirect Effects)	Overall Impact Magnitude[e]
5264 Sonora-Mojave Creosotebush-White Bursage Desert Scrub: Occurs in broad valleys, lower bajadas, plains, and low hills in the Mojave and Sonoran Deserts. Shrubs form a sparse to moderately dense cover (2–50%), although the ground surface may be mostly barren. The dominant species are typically creosotebush (*Larrea tridentata*) and white bursage (*Ambrosia dumosa*). Other shrubs, dwarf-shrubs, and cacti may also be dominant or form sparse understories. Herbaceous species are typically sparse, but may be seasonally abundant.	109,933 acres[f] (5.0%, 8.0%)	229,999 acres (10.4%)	Moderate
3180 North American Warm Desert Volcanic Rockland: Consists of barren and sparsely vegetated (<10% plant cover) areas. Vegetation is variable and typically includes scattered desert shrubs.	29,579 acres (8.5%, 10.4%)	135,364 acres (38.8%)	Moderate
3121 North American Warm Desert Active and Stabilized Dune: Consists of unvegetated to sparsely vegetated (generally <10% plant cover) active dunes and sand sheets. Vegetation includes shrubs, forbs, and grasses. Includes unvegetated "blowouts" and stabilized areas.	26,798 acres (31.8%, 41.6%)	15,987 acres (19.0%)	Large
9151 North American Warm Desert Wash: Consists of intermittently flooded linear or braided strips within desert scrub or grassland landscapes on bajadas, mesas, plains, and basin floors. Although often dry, washes are associated with rapid sheet and gully flow. The vegetation varies from sparse and patchy to moderately dense and typically occurs along the banks, but may occur within the channel. Shrubs and small trees are typically intermittent to open. Common upland shrubs often occur along the edges.	24,976 acres (3.9%, 6.8%)	79,324 acres (12.4%)	Moderate
3120 North American Warm Desert Bedrock Cliff and Outcrop: Occurs on subalpine to foothill steep cliff faces, narrow canyons, rock outcrops, unstable scree, and talus slopes. Consists of barren and sparsely vegetated areas (generally <10% plant cover) with desert species, especially succulents. Lichens are predominant in some areas.	5,640 acres (0.6%, 1.0%)	115,696 acres (12.2%)	Small

TABLE 9.4.10.1-1 (Cont.)

Land Cover Type[a]	Area of Cover Type Affected (acres)[b] Within SEZ[c] (Direct Effects)	Outside SEZ[d] (Indirect Effects)	Overall Impact Magnitude[e]
3143 North American Warm Desert Pavement: Consists of unvegetated to very sparsely vegetated (<2% plant cover) areas, usually in flat basins, with ground surfaces of fine to medium gravel coated with "desert varnish." Desert scrub species are usually present. Herbaceous species may be abundant in response to seasonal precipitation.	1,588 acres (4.3%, 9.1%)	9,797 acres (26.6%)	Moderate
3161 North American Warm Desert Playa: Consists of barren and sparsely vegetated areas (generally <10% plant cover) that are intermittently flooded; salt crusts are common. Sparse shrubs occur around the margins, and patches of grass may form in depressions. In large playas, vegetation forms rings in response to salinity. Herbaceous species may be periodically abundant.	1,570 acres (2.3%, 2.7%)	828 acres (1.2%)	Moderate
5265 Sonora-Mojave Mixed Salt Desert Scrub: Extensive open-canopied shrublands in the Mojave and Sonoran Deserts, usually occurring around playas and in valley bottoms or basins with saline soils. Vegetation is typically composed of one or more *Atriplex* species; other salt-tolerant plants are often present or even co-dominant. Grasses occur at varying densities.	1,563 acres (2.8%, 7.2%)	5,103 acres (9.1%)	Moderate
21, 22 Developed, Open Space—Low Intensity: Includes housing, parks, golf courses, and other areas planted in developed settings. Impervious surfaces compose up to 49% of the total land cover.	898 acres (2.5%, 8.6%)	9,243 acres (26.2%)	Moderate
9178 North American Warm Desert Riparian Mesquite Bosque: Occurs along perennial and intermittent streams as relatively dense riparian corridors composed of trees and shrubs. Honey mesquite (*Prosopis glandulosa*) and velvet mesquite (*P. velutina*) are the dominant trees. Vegetation is supported by groundwater when surface water is absent.	223 acres (2.5%, 13.3%)	8 acres (0.1%)	Moderate
23, 24 Developed, Medium-High Density: Includes housing and commercial/industrial development. Impervious surfaces compose 50–100% of the total land cover.	67 acres (0.9%, 6.0%)	649 acres (9.1%)	Small
81, 82 Hay/Pasture, Cultivated Crops: Areas where pasture/hay or cultivated crops account for more than 20% of total vegetation cover.	54 acres (<0.1%, 0.6%)	49,248 acres (10.1%)	Small

TABLE 9.4.10.1-1 (Cont.)

Land Cover Type[a]	Area of Cover Type Affected (acres)[b] Within SEZ[c] (Direct Effects)	Outside SEZ[d] (Indirect Effects)	Overall Impact Magnitude[e]
3139 Inter-Mountain Basins Shale Badland: Typically occurs on rounded hills and plains. Consists of barren and sparsely vegetated areas (<10% plant cover) with high rate of erosion and deposition. Vegetation consists of sparse dwarf shrubs and herbaceous plants.	23 acres (0.2%, 0.4%)	3,335 acres (22.7%)	Small
9182 North American Warm Desert Riparian Woodland and Shrubland: Occurs along medium to large perennial streams in canyons and desert valleys. Consists of a mix of riparian woodlands and shrublands. Vegetation is dependent upon annual or periodic flooding, along with substrate scouring, and/or a seasonally shallow water table.	0 acres	326 acres (1.2%)	Small
5259 Mojave Mid-Elevation Mixed Desert Scrub: Vegetation composition is quite variable. Dominant species include shrubs forbs, and grasses and may include *Yucca* spp.	0 acres	248 acres (2.2%)	Small
11 Open Water: Plant or soil cover is generally less than 25%.	0 acres	101 acres (0.4%)	Small

[a] Land cover descriptions are from NatureServe (2010). Full descriptions of land cover types, including plant species, can be found in Appendix J.

[b] Area in acres, determined from Sanborn Mapping (2008).

[c] Includes the area of the cover type within the SEZ, the percentage that area represents of all occurrences of that cover type within the SEZ region (i.e., a 50-mi [80-km] radius from the center of the SEZ), and the percentage that area represents of all occurrences of that cover type on BLM lands within the SEZ region. The SEZ region intersects portions of California and Arizona. However, the SEZ and affected area occur only in California.

[d] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary where ground-disturbing activities would not occur. Indirect effects include effects from surface runoff, dust, and other factors from project facilities. The potential degree of indirect effects would decrease with increasing distance from the SEZ. Includes the area of the cover type within the indirect effects area and the percentage that area represents of all occurrences of that cover type within the SEZ region.

[e] Overall impact magnitude categories were based on professional judgment and include (1) *small*: a relatively small proportion (≤1%) of the cover type within the SEZ region would be lost; (2) *moderate*: an intermediate proportion (>1 but ≤10%) of a cover type would be lost; and (3) *large*: >10% of a cover type would be lost.

[f] To convert acres to km^2, multiply by 0.004047.

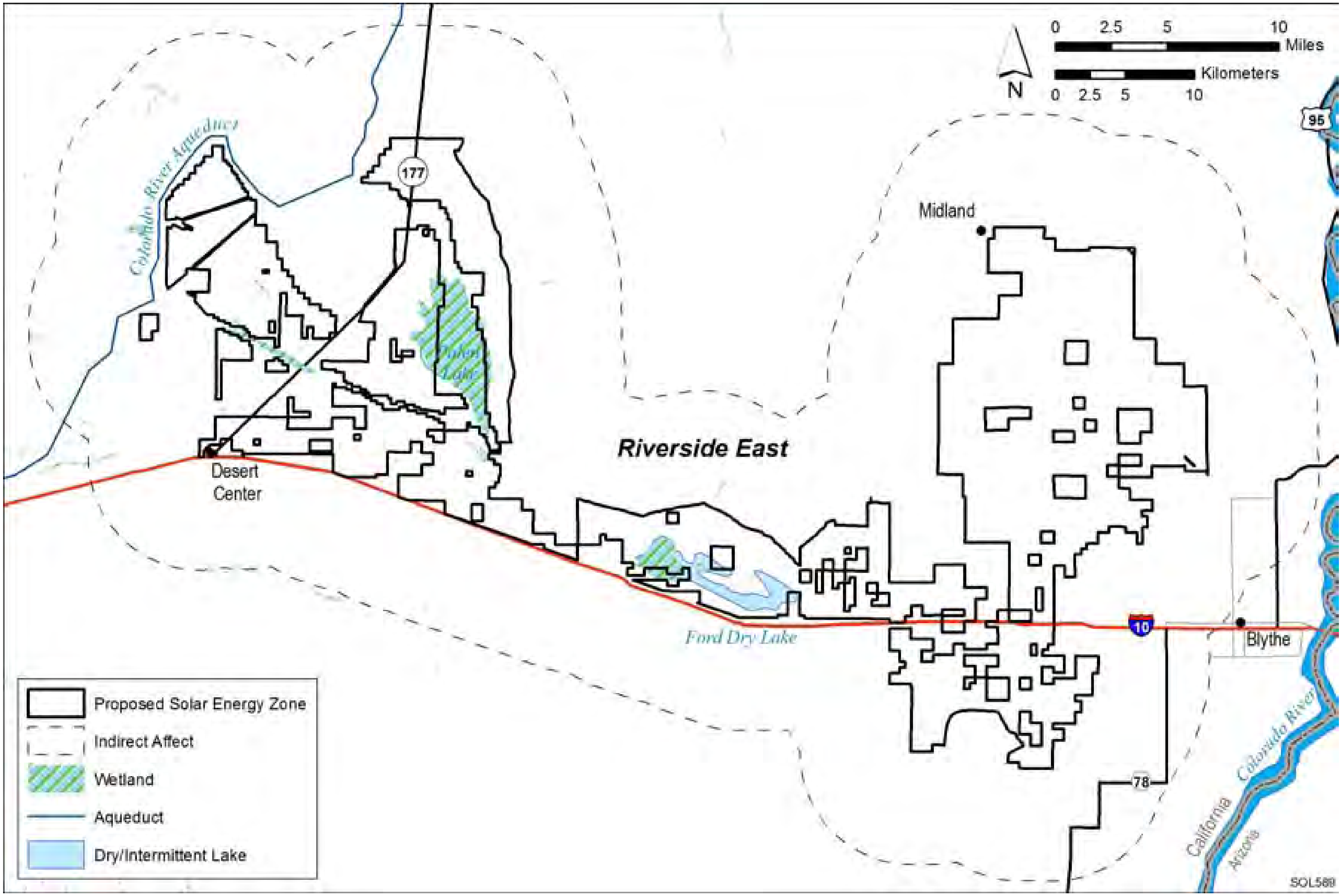

FIGURE 9.4.10.1-2 Wetlands within the Proposed Riverside East SEZ (Source: USFWS 2009)

TABLE 9.4.10.1-2 Wetlands of the Proposed Riverside East SEZ

Wetland Type and Size Range	Area within SEZ	Number/Total Wetland Area/ Area within SEZ
Lacustrine, unconsolidated shore 23–8,178 acres[a]	23–2,214 acres	6/9,860 acres/3,517 acres
Palustrine, emergent 0.2–14 acres	0.2–14 acres (100%)	10/32 acres/32 acres
Palustrine, scrub shrub 1–117 acres	1–117 acres	8/124 acres/124 acres
Palustrine, unconsolidated shore 0.3–10 acres	0.3–10 acres	10/38 acres/38 acres
Riverine, unconsolidated shore 5–717 acres	5–53 acres	3/774 acres/96 acres

[a] To convert acres to km^2, multiply by 0.004047.

Source: USFWS (2009).

Ford Dry Lake, which is located in the central portion of the SEZ. Ten wetlands are classified as palustrine wetlands with emergent plant communities, with a total of 32 acres (0.1 km^2) mapped within the SEZ. Emergent plant communities are composed primarily of herbaceous species rooted in shallow water or saturated soil. Eight wetlands are classified as palustrine wetlands with scrub shrub plant communities, with a total of 124 acres (0.5 km^2) mapped within the SEZ. Scrub shrub plant communities are composed primarily of short woody species, although herbaceous species may also be present. Ten wetlands are classified as palustrine unconsolidated shore wetlands, with a total of 38 acres (0.2 km^2) mapped within the SEZ. Three wetlands are classified as riverine unconsolidated shore wetlands, with a total of 96 acres (0.4 km^2) mapped within the SEZ. Desert dry washes in the SEZ support microphyll woodlands that include ironwood, smoketree, and blue palo verde. An ironwood forest, identified by BLM as a Unique Plant Assemblage, occurs in the upper reaches of McCoy Wash. Numerous vegetated and unvegetated ephemeral washes occur within the SEZ, as well as washes and swales that support communities of creosotebush and big galleta grass (*Pleuraphis rigida*) (BLM and CEC 2010a–c). These dry washes typically contain water for short periods during or following precipitation events and include temporarily flooded areas. Ephemeral washes provide surface flows to downstream habitats including playas. One-hundred-thirteen wetlands are located within the indirect impact area. These include lacustrine unconsolidated shore, palustrine emergent, palustrine scrub shrub, palustrine unconsolidated shore, palustrine unconsolidated bottom, and palustrine and riverine unconsolidated shore wetlands.

The proposed Riverside East SEZ is located within the Low Desert Weed Management Area (LDWMA). Table 9.4.10.1-3 provides a list of weed species of the California Sonoran

TABLE 9.4.10.1-3 Weed Species of the California Sonoran Desert Region

Common Name	Scientific Name
Barbwire Russian thistle	*Salsola paulsenii*
Bermudagrass	*Cynodon dactylon*
Camelthorn	*Alhagi maurorum*
Common Russian thistle	*Salsola tragus*
Field bindweed	*Convolvulus arvensis*
Giant reed	*Arundo donax*
Giant salvinia	*Salvinia auriculata*
Hydrilla	*Hydrilla verticillata*
Scarlet wisteria	*Sesbania punicea*
Tamarisk	*Tamarix ramosissima*
Tocalote	*Centaurea melitensis*
White horsenettle	*Solanum elaeagnifolium*

Source: CDFA (2010).

Desert Region, which includes the LDWMA. Invasive species known to occur within the SEZ include tamarisk, which occurs along wet areas, Sahara mustard (*Brassica tournefortii*), cheatgrass (*Bromus tectorum*), Russian thistle (*Salsola* sp.), Mediterranean grass (*Schismus arabicus, S. barbatus*), and red brome (*Bromus madritensis* ssp. *rubens*) (BLM and CEC 2010a–c).

9.4.10.2 Impacts

The construction of solar energy facilities within the Riverside East SEZ would result in direct impacts on plant communities because of the removal of vegetation within the facility footprint during land-clearing and land-grading operations. Approximately 80% of the SEZ (162,345 acres [657 km^2]) would be expected to be cleared with full development of the SEZ. The plant communities affected would depend on facility locations and could include any of the communities that occur on the SEZ. Therefore, for the purposes of this analysis, all the area of each cover type within the SEZ is considered to be directly affected by removal with full development of the SEZ.

Indirect effects (caused, for example, by surface runoff or dust from the SEZ) have the potential to degrade affected plant communities and may reduce biodiversity by promoting the decline or elimination of species sensitive to disturbance. Indirect effects can also cause an increase in disturbance-tolerant species or invasive species. High impact levels could result in the elimination of a community or the replacement of one community type by another. The proper implementation of programmatic design features, however, would reduce indirect effects to a minor or small level of impact.

Possible impacts from solar energy facilities on vegetation encountered within the SEZ, as well as general mitigation measures, are described in more detail in Section 5.10.5. Any such impacts will be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through additional SEZ-specific design features given in Section 9.4.10.3.

9.4.10.2.1 Impacts on Native Species

The impacts of construction, operation, and decommissioning were considered small if the impact affected a relatively small proportion (<1%) of the cover type in the SEZ region (within 50 mi [80 km] of the center of the SEZ); a moderate impact (>1 but <10%) could affect an intermediate proportion of cover type; a large impact could affect greater than 10% of a cover type.

Solar facility construction and operation would primarily affect communities of the Sonora-Mojave Creosotebush-White Bursage Desert Scrub cover type. Additional cover types within the SEZ that would be affected include North American Warm Desert Volcanic Rockland, North American Warm Desert Active and Stabilized Dune, North American Warm Desert Wash, North American Warm Desert Bedrock Cliff and Outcrop, North American Warm Desert Pavement, North American Warm Desert Playa, Sonora-Mojave Mixed Salt Desert Scrub, North American Warm Desert Riparian Mesquite Bosque, and Inter-Mountain Basins Shale Badland. Although Hay/Pasture, Cultivated Crops, Developed, Open Space—Low Intensity, and Developed, Medium-High Density cover types occur within the SEZ, these areas likely support few native plant communities. Table 9.4.10.1-1 summarizes the potential impacts on native species cover types that would result from solar energy facilities in the proposed Riverside East SEZ. Many of these cover types are relatively common in the SEZ region; however, several are relatively uncommon, representing less than 1% of the land area within the SEZ region: North American Warm Desert Pavement (0.7%), Inter-Mountain Basins Shale Badland (0.3%), and North American Warm Desert Riparian Mesquite Bosque (0.2%).

The construction, operation, and decommissioning of solar projects within the SEZ would result in large impacts on North American Warm Desert Active and Stabilized Dune and moderate impacts on Sonora-Mojave Creosotebush-White Bursage Desert Scrub, North American Warm Desert Volcanic Rockland, North American Warm Desert Wash, North American Warm Desert Pavement, North American Warm Desert Playa, Sonora-Mojave Mixed Salt Desert Scrub, Developed, Open Space—Low Intensity, and North American Warm Desert Riparian Mesquite Bosque. Most of the playa cover type is associated with Ford Dry Lake. Solar project development within the SEZ would result in small impacts on the remaining cover types in the affected area. Sand dune, playa, desert chenopod scrub/mixed salt desert scrub (primarily associated with Ford Dry Lake), desert ephemeral dry wash communities, and dry wash microphyll woodlands are important sensitive habitats in the region.

Disturbance of vegetation in dune communities within the SEZ, such as from heavy equipment operation, could result in the loss of substrate stabilization. Re-establishment of dune species could be difficult due to the arid conditions and unstable substrates. Because of the arid conditions, reestablishment of desert scrub or other communities in temporarily disturbed areas would likely be very difficult and might require extended periods of time. In addition, noxious weeds could become established in disturbed areas and colonize adjacent undisturbed habitats, thus reducing restoration success and potentially resulting in widespread habitat degradation. Cryptogamic soil crusts occur in many of the shrubland communities in the region and likely occur on the SEZ. Damage to these crusts, by the operation of heavy equipment or other vehicles, can alter important soil characteristics, such as nutrient cycling and availability, and affect plant community characteristics (Lovich and Bainbridge 1999).

The deposition of fugitive dust from disturbed soil areas in habitats outside a solar project area could result in reduced productivity or changes in plant community composition. Fugitive dust deposition could affect plant communities of each of the cover types occurring within the indirect impact area identified in Table 9.4.10.1-1.

Potential impacts on wetlands as a result of solar energy facility development are described in Section 5.6.1. Specific to the affected area of the proposed Riverside East SEZ, approximately 3,807 acres (15.4 km^2) of wetland habitat occurs within the SEZ and could be affected by project development.

Grading could result in direct impacts on the wetlands within the SEZ if fill material is placed within wetland areas. Grading near the wetlands in or near the SEZ could disrupt surface water or groundwater flow characteristics, resulting in changes in the frequency, duration, depth, or extent of inundation or soil saturation, and could potentially alter wetland plant communities and affect wetland function adjacent to or downgradient from solar projects. Increases in surface runoff from a solar energy project site could also affect wetland hydrologic characteristics. The introduction of contaminants into wetlands in or near the SEZ could result from spills of fuels or other materials used on a project site. Soil disturbance could result in sedimentation in wetland areas, which could degrade or eliminate wetland plant communities. Sedimentation effects or hydrologic changes could also extend to wetlands outside of the SEZ. Grading could also affect dry washes within the SEZ, and alteration of surface drainage patterns or hydrology could adversely affect downstream dry wash, playa, or chenopod scrub communities. Vegetation within these communities could be lost by erosion or desiccation. See Section 9.4.9 for further discussion of impacts on washes and playas.

Although the use of groundwater within the Riverside East SEZ for technologies with high water requirements, such as wet-cooling systems, is considered unlikely, groundwater withdrawals for such systems could reduce groundwater discharge along riparian areas. Reductions in groundwater discharges at springs and seeps that support riparian habitats could result in degradation of these habitats. Communities that depend on accessible groundwater, such as mesquite bosque or bush seep-weed communities, could become degraded or lost as a result of lowered groundwater levels (BLM and CEC 2010b).

9.4.10.2.2 Impacts from Noxious Weeds and Invasive Plant Species

On February 8, 1999, the President signed E.O. 13112, "Invasive Species," which directs federal agencies to prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts of invasive species (*Federal Register*, Volume 64, page 61836, Feb. 8, 1999). Potential impacts of noxious weeds and invasive plant species resulting from solar energy facilities are described in Section 5.10.1. Despite required programmatic design features to prevent the spread of noxious weeds, project disturbance could potentially increase the prevalence of noxious weeds and invasive species in the affected area of the proposed Riverside East SEZ, such that weeds could be transported into areas that were previously relatively weed-free, which could result in reduced restoration success and possible widespread habitat degradation.

Invasive species, including tamarisk, Sahara mustard, cheatgrass, Russian thistle, Mediterranean grass, and red brome, occur on the SEZ. Weed species known to occur in the Sonoran Desert Region are given in Table 9.4.10.1-3.

Past or present land uses may affect the susceptibility of plant communities to the establishment of noxious weeds and invasive species. Small areas of Developed, Open Space—Low Intensity, totaling about 898 acres (3.6 km^2), occur within the SEZ, and approximately 9,243 acres (37.4 km^2) occur in the indirect impact area; about 67 acres (0.3 km^2) of Developed, Medium-High Density occur within the SEZ and 649 acres (2.6 km^2) occur within the indirect impact area. The developed areas likely support few native plant communities. Because disturbance may promote the establishment and spread of invasive species, developed areas may provide sources of such species. Existing roads, transmission lines, and recreational OHV use within the SEZ area of potential impact also likely contribute to the susceptibility of plant communities to the establishment and spread of noxious weeds and invasive species.

9.4.10.3 SEZ-Specific Design Features and Design Feature Effectiveness

In addition to programmatic design features, SEZ-specific design features would reduce the potential for impacts on plant communities. While some SEZ-specific design features are best established when project details are considered, some design features can be identified at this time, as follows.

- An Integrated Vegetation Management Plan, addressing invasive species control, and an Ecological Resources Mitigation and Monitoring Plan, addressing habitat restoration and management, should be approved and implemented to increase the potential for successful restoration of creosotebush-white bursage desert scrub communities and other affected habitats and minimize the potential for the spread of tamarisk, Sahara mustard, cheatgrass, or other invasive species. Invasive species control should focus on biological and mechanical methods where possible to reduce the use of herbicides.

- All wetland, riparian, playa, dry wash (including dry wash microphyll woodland), sand dune and sand transport areas, and chenopod scrub habitats within the SEZ should be avoided to the extent practicable, and any impacts minimized and mitigated. A buffer area should be maintained around wetland, riparian, playa, and dry wash communities to reduce the potential for impacts on these communities on or near the SEZ.

- Appropriate engineering controls should be used to minimize impacts on wetland, riparian, playa, dry wash woodland, and chenopod scrub, including downstream occurrences, resulting from surface water runoff, erosion, sedimentation, altered hydrology, accidental spills, or fugitive dust deposition to these habitats. Appropriate buffers and engineering controls would be determined through agency consultation.

- Groundwater withdrawals should be limited to reduce the potential for indirect impacts on riparian habitat that is associated with groundwater discharge or groundwater-dependent communities, such as mesquite bosque or bush seep-weed communities.

If these SEZ-specific design features are implemented in addition to programmatic design features, it is anticipated that a high potential for impacts from invasive species and potential impacts on wetland, riparian, playa, dry wash (including dry wash microphyll woodland), sand dune, and chenopod scrub habitats would be reduced to a minimal potential for impact.

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9.4.11 Wildlife and Aquatic Biota

This section addresses wildlife (amphibians, reptiles, birds, and mammals) and aquatic biota that could occur within the potentially affected area of the proposed Riverside East SEZ. Wildlife known to occur within 50 mi (80 km) of the SEZ (i.e., the SEZ region) was determined from the California Wildlife Habitat Relationships System (CDFG 2008). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005, 2007). The amount of aquatic habitat within the SEZ region was determined by estimating the length of linear perennial stream and canal features and the area of standing water body features (i.e., ponds, lakes, and reservoirs) within 50 mi (80 km) of the SEZ with available GIS surface water data sets.

The affected area considered in this assessment included the areas of direct and indirect effects. The area of direct effects was defined as the area that would be physically modified during project development (i.e., where ground-disturbing activities would occur within the SEZ). The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary, where ground-disturbing activities would not occur but that could be indirectly affected by activities in the area of direct effects (e.g., surface runoff, dust, noise, lighting, and accidental spills from the SEZ). The potential degree of indirect effects would decrease with increasing distance from the SEZ. This area of indirect effects was identified on the basis of professional judgment and was considered sufficiently large to bound the area that would potentially be subject to indirect effects.

The affected area is the area bounded by the areas of direct and indirect effects. These areas are defined and the impact assessment approach is described in Appendix M. No area of direct or indirect effects was assumed for a new transmission line or access road, because of the proximity of existing transmission lines and roads to the SEZ.

Dominant vegetation in the affected area is desertscrub, and the primary land cover habitat type within the affected area is Sonora-Mojave creosotebush-white bursage desertscrub (see Section 9.4.10). Potentially unique habitats in the affected area in which wildlife species may reside include desert dunes, cliffs and rock outcrops, volcanic rocklands, desert washes, and playa wetland habitats. Playa wetland habitats in the affected area include Ford Dry Lake and Palen Lake as well as the CRA. Palen Lake is located in the western portion of the SEZ; Ford Lake is in the center of the SEZ. The CRA is located along the western border of the SEZ (Figure 9.4.12.1-1). There are also a number of desert washes on the SEZ that may provide habitat for unique plant assemblages.

9.4.11.1 Amphibians and Reptiles

9.4.11.1.1 Affected Environment

This section addresses amphibian and reptile species that are known to occur, or for which potentially suitable habitat occurs, on or within the potentially affected area of the proposed Riverside East SEZ. The list of amphibian and reptile species potentially present in the project area was determined from range maps and habitat information available from CWHRS (CDFG 2008). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005, 2007). See Appendix M for additional information on the approach used.

Based on the range, habitat preferences, and/or presence of potentially suitable land cover for the amphibian species that occur within southeastern California (CDFG 2008; USGS 2004, 2005, 2007), the Couch's spadefoot (*Scaphiopus couchii*) and red-spotted toad (*Bufo punctatus*) would be expected to occur within the proposed Riverside East SEZ. The most likely areas for these species to occur within the SEZ are in the area of Ford Dry Lake (near the center of the SEZ) and Palen Lake (in the western portion of the SEZ). Several other amphibian species could inhabit the CRA along the western boundary of the SEZ. These species include the bullfrog (*Rana catesbeiana*), Colorado River toad (*Bufo alvarius*), Rio Grande leopard frog (*Rana berlandieri*), and Woodhouse's toad (*Bufo woodhousii*). Because these species tend to occur within 300 ft (100 m) of permanent water (USGS 2007), they would not be expected to occur with any regularity in the SEZ.

Thirty-one reptile species could occur within the Riverside East SEZ (CDFG 2008): one tortoise, 13 lizard, and 17 snake species. The desert tortoise (*Gopherus agassizii*) is a federal and state-listed threatened species. This species is discussed in Section 9.4.12. Among the more common lizard species that could occur within the SEZ are the desert horned lizard (*Phrynosoma platyrhinos*), long-nosed leopard lizard (*Gambelia wislizenii*), Mojave fringe-toed lizard (*Uma scoparia*), side-blotched lizard (*Uta stansburiana*), western banded gecko (*Coleonyx variegatus*), and zebra-tailed lizard (*Callisaurus draconoides*).

The most common snake species expected to occur within the Riverside East SEZ are the coachwhip (*Masticophis flagellum*), glossy snake (*Arizona elegans*), gophersnake (*Pituophis catenifer*), groundsnake (*Sonora semiannulata*), and long-nosed snake (*Rhinocheilus lecontei*). The Mojave rattlesnake (*Crotalus scutulatus*) and sidewinder (*C. cerastes*) would be the most common poisonous snake species expected to occur on the SEZ.

Table 9.4.11.1-1 provides habitat information for the amphibian and reptile species that could occur on or in the affected area of the proposed Riverside East SEZ.

9.4.11.1.2 Impacts

The potential for impacts on amphibians and reptiles from utility-scale solar energy development within the proposed Riverside East SEZ is presented in this section. The types of impacts that amphibians and reptiles could incur from construction, operation, and decommissioning of utility-scale solar energy facilities are discussed in Section 5.10.2.1. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and the application of any additional mitigation. Section 9.4.11.1.3, below, identifies SEZ-specific design features of particular relevance to the Riverside East SEZ.

TABLE 9.4.11.1-1 Representative Amphibians and Reptiles That Could Occur on or in the Affected Area of the Proposed Riverside East SEZ and Potential Impacts

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a] Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a] Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Amphibians				
Couch's spadefoot (*Scaphiopus couchii*)	Desert washes, desert riparian, palm oasis, desert succulent shrub, and desert scrub habitats. Requires pools or potholes with water that lasts longer than 10 to 12 days for breeding sites. About 2,225,100 acres[f] of potentially suitable habitat occurs in the SEZ region.	110,156 acres of potentially suitable habitat lost (5.0% of available potentially suitable habitat)	230,007 acres of potentially suitable habitat (10.3% of available potentially suitable habitat)	Moderate. Avoid development in Ford Dry Lake and Palen Lake.
Red-spotted toad (*Bufo punctatus*)	Rocky canyons and gullies in deserts, grasslands, and dry woodlands. When inactive, it occurs under rocks, in rock crevices, or underground. Often found near rocky areas associated with spring seepages, intermittent streams, and cattle tanks. Breeds in shallow water of temporary rain pools, spring-fed pools, and pools along intermittent streams. About 2,522,400 acres of potentially suitable habitat occurs in the SEZ region.	111,496 acres of potentially suitable habitat lost (4.4% of available potentially suitable habitat)	235,350 acres of potentially suitable habitat (9.3% of available potentially suitable habitat)	Moderate. Avoid development in Ford Dry Lake and Palen Lake.
Lizards				
Desert horned lizard (*Phrynosoma platyrhinos*)	Deserts dominated by sagebrush, creosote bush, greasewood, or cactus. Occurs on sandy flats, alluvial fans, washes, and edges of dunes. Burrows in soil during periods of inactivity. Common throughout Mojave and Colorado Deserts. About 4,698,800 acres of potentially suitable habitat occurs in the SEZ region.	162,473 acres of potentially suitable habitat lost (3.5% of available potentially suitable habitat)	596,015 acres of potentially suitable habitat (12.7% of available potentially suitable habitat)	Moderate. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 9.4.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Lizards (Cont.)				
Long-nosed leopard lizard (*Gambelia wislizenii*)	Desert and semidesert areas with scattered shrubs. Prefers sandy or gravelly flats and plains. Also prefers areas with abundant rodent burrows, which it occupies when inactive. Widely distributed in the Mojave, Colorado, and other desert areas in California. About 2,522,500 acres of potentially suitable habitat occurs in the SEZ region.	111,496 acres of potentially suitable habitat lost (4.4% of available potentially suitable habitat)	235,350 acres of potentially suitable habitat (9.3% of available potentially suitable habitat)	Moderate
Mojave fringe-toed lizard (*Uma scoparia*)	Restricted to sparsely vegetated windblown sand of dunes, flats, riverbanks, and washes. Requires fine, loose sand for burrowing. About 2,303,800 acres of potentially suitable habitat occurs in the SEZ region.	136,731 acres of potentially suitable habitat lost (5.9% of available potentially suitable habitat)	245,986 acres of potentially suitable habitat (10.7% of available potentially suitable habitat)	Moderate
Side-blotched lizard (*Uta stansburiana*)	Arid and semiarid locations with scattered bushes or scrubby trees. Often occurs in sandy washes with scattered rocks and bushes. About 4,053,700 acres of potentially suitable habitat occurs in the SEZ region.	140,549 acres of potentially suitable habitat lost (3.5% of available potentially suitable habitat)	425,267 acres of potentially suitable habitat (10.5% of available potentially suitable habitat)	Moderate
Western banded gecko (*Coleonyx variegatus*)	Wide variety of habitats including deserts with creosotebush and sagebrush and pinyon-juniper woodlands. Inhabits both rocky areas and barren dunes. Most abundant in sandy flats and desert washes. Uses rocks, burrows, and spaces beneath vegetative debris or trash during periods of inactivity. About 3,265,500 acres (of potentially suitable habitat occurs in the SEZ region.	138,265 acres of potentially suitable habitat lost (4.2% of available potentially suitable habitat)	315,836 acres of potentially suitable habitat (9.7% of available potentially suitable habitat)	Moderate

TABLE 9.4.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Lizards (Cont.)				
Zebra-tailed lizard (*Callisaurus draconoides*)	Sparsely vegetated deserts on open sandy washes, dunes, floodplains, beaches, or desert pavement. Common and widely distributed throughout Mojave and Colorado Deserts. About 3,734,800 acres of potentially suitable habitat occurs in the SEZ region.	162,473 acres of potentially suitable habitat lost (4.4% of available potentially suitable habitat)	476,984 acres of potentially suitable habitat (12.8% of available potentially suitable habitat)	Moderate. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Snakes				
Coachwhip (*Masticophis flagellum*)	Wide variety of open terrain habitats. Most abundant in deserts, grasslands, scrub, chaparral, and pastures. Prefers relatively dry open terrain. It seeks cover in burrows, rocks, or vegetation. About 3,488,700 acres of potentially suitable habitat occurs in the SEZ region.	142,371 acres of potentially suitable habitat lost (4.1% of available potentially suitable habitat)	361,682 acres of potentially suitable habitat (10.4% of available potentially suitable habitat)	Moderate
Glossy snake (*Arizona elegans*)	Variety of habitats including barren to sparsely shrubby deserts, sagebrush flats, grasslands, and sandhills. Prefers sandy areas with scattered brush, but also occurs in rocky areas. Shelters and lays eggs underground. Common throughout southern California, particularly the desert regions. About 3,186,500 acres of potentially suitable habitat occurs in the SEZ region.	161,930 acres of potentially suitable habitat lost (5.1% of available potentially suitable habitat)	325,318 acres of potentially suitable habitat (10.2% of available potentially suitable habitat)	Moderate. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

TABLE 9.4.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a] Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a] Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Snakes (Cont.)				
Gophersnake (*Pituophis catenifer*)	Wide variety of habitats including deserts, prairies, shrublands, woodlands, and farmlands. May dig its burrow or occupy mammal burrows. Eggs are laid in burrows or under large rocks or logs. Most widespread and common snake in California. About 3,483,600 acres of potentially suitable habitat occurs in the SEZ region.	162,473 acres of potentially suitable habitat lost (4.7% of available potentially suitable habitat)	341,715 acres of potentially suitable habitat (9.8% of available potentially suitable habitat)	Moderate. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.
Groundsnake (*Sonora semiannulata*)	Arid and semiarid areas including desert flats, sand hummocks, and rocky hillsides with pockets of loose soil. Ranges from prairie and desert lowlands to pinyon-juniper and oak-pine zone. About 2,502,900 acres of potentially suitable habitat occurs in the SEZ region.	110,156 acres of potentially suitable habitat lost (4.4% of available potentially suitable habitat)	230,581 acres of potentially suitable habitat (9.2% of available potentially suitable habitat)	Moderate
Long-nosed snake (*Rhinocheilus lecontei*)	Typically inhabits deserts, dry prairies, and river valleys. Occurs by day and lays eggs underground or under rocks. Burrows rapidly in loose soil. Common in desert regions. About 997,700 acres of potentially suitable habitat occurs in the SEZ region.	51,997 acres of potentially suitable habitat lost (5.2% of available potentially suitable habitat)	95,645 acres of potentially suitable habitat (9.6% of available potentially suitable habitat)	Moderate
Mojave rattlesnake (*Crotalus scutulatus*)	Mostly upland desert and lower mountain slopes including barren desert, grasslands, open woodland, and scrubland. Generally avoids broken rocky terrain or densely vegetated areas. Takes refuge in animal burrows or spaces under or among rocks. Widely distributed throughout the Mojave and extreme northern Colorado Deserts. About 2,502,800 acres of potentially suitable habitat occurs in the SEZ region.	110,156 acres of potentially suitable habitat lost (4.4% of available potentially suitable habitat)	239,581 acres of potentially suitable habitat (9.2% of available potentially suitable habitat)	Moderate

TABLE 9.4.11.1-1 (Cont.)

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Snakes (Cont.)				
Sidewinder (*Crotalus. cerastes*)	Open desert terrain with fine windblown sand, desert flats with sandy washes, or sparsely vegetated sand dunes. Concentrates near washes and areas of relatively dense vegetation where mammal burrows are common. During periods of inactivity, uses underground burrows, occurs under bushes, or almost completely snuggles under sand. Widely distributed and locally abundant in the Mojave and Colorado Deserts. About 2,577,500 acres of potentially suitable habitat occurs in the SEZ region.	136,731 acres of potentially suitable habitat lost (5.3% of available potentially suitable habitat)	246,560 acres of potentially suitable habitat (9.6% of available potentially suitable habitat)	Moderate

[a] Maximum area of potentially suitable habitat affected relative to total available potentially suitable habitat within the SEZ region (i.e., a 50-mi [80-km] radius from the center of the SEZ). Habitat availability was determined from potentially suitable land cover for each species (USGS 2004, 2005, 2007).

[b] Direct effects within the SEZ consist of ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations. A maximum of 162,473 acres would be developed in the SEZ.

[c] The area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary. Indirect effects include effects from surface runoff, dust, noise, lighting, etc., from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance from the SEZ boundary.

[d] Overall impact magnitude categories were based on professional judgment and were (1) *small*: ≤1% of potentially suitable habitat for the species would be lost and the activity would not result in a measurable change in the carrying capacity or population size in the affected area; (2) *moderate*: >1 but ≤10% of potentially suitable habitat for the species would be lost and the activity would potentially result in a measurable but moderate (not destabilizing) change in the carrying capacity or population size in the affected area; and (3) *large*: >10% of potentially suitable habitat for the species would be lost and the activity would result in a potentially large, measurable, and destabilizing change in the carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects, because those effects would be difficult to mitigate. Programmatic design features would reduce most indirect effects to negligible levels.

Footnotes continued on next page.

TABLE 9.4.11.1-1 (Cont.)

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[e] Species-specific mitigation is presented for those species that have particular habitat features that could be readily avoided. For species or individuals occurring outside the SEZ (in the area of indirect effects), no mitigation measures beyond required programmatic design features have been identified.

[f] To convert acres to km^2, multiply by 0.004047.

Sources: CDFG (2008); NatureServe (2010); USGS (2004, 2005, 2007).

The assessment of impacts on amphibians and reptile species is based on available information on the presence of species in the affected area as presented in Section 9.4.11.1.1, following the analysis approach described in Appendix M. Additional NEPA assessments and coordination with state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid or mitigate impacts on amphibians and reptiles (see Section 9.4.11.1.3).

In general, impacts on amphibians and reptiles would result from habitat disturbance (i.e., habitat reduction, fragmentation, and alteration) and from disturbance, injury, or mortality to individual amphibians and reptiles. Table 9.4.11.1-1 summarizes the potential impacts on representative amphibian and reptile species resulting from solar energy development that could occur on or in the affected area in the proposed Riverside East SEZ. Direct impacts on representative amphibian and reptile species would be moderate, because 3.5 to 5.9% of potentially suitable habitats for the species in the SEZ region would be lost (Table 9.4.11.1-1). Larger areas of potentially suitable habitats for the amphibian and reptile species occur within the area of potential indirect effects (e.g., up to 12.8% of available habitat for the zebra-tailed lizard). Other impacts on amphibians and reptiles could result from surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, accidental spills, collection, and harassment. These indirect impacts are expected to be negligible with implementation of programmatic design features.

Decommissioning of facilities and reclamation of disturbed areas after operations cease could result in short-term negative impacts on individuals and habitats adjacent to project areas, but long-term benefits would accrue if suitable habitats were restored in previously disturbed areas. Section 5.10.2.1.4 provides an overview of the impacts of decommissioning and reclamation on wildlife. Of particular importance for amphibian and reptile species would be the restoration of original ground surface contours, soils, and native plant communities associated with semiarid shrublands.

9.4.11.1.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A, Section A.2.2, would reduce the potential for effects on amphibians and reptiles, especially for species using habitat types that can be avoided (e.g., the ephemeral drainages, playa, dry lake, wetlands, and the CRA). Indirect impacts could be reduced to negligible levels by implementing programmatic design features, especially those engineering controls that would reduce runoff, sedimentation, spills, and fugitive dust. While SEZ-specific design features are best established when project details are considered, design features that can be identified at this time include the following:

- The potential for indirect impacts on several amphibian species could be reduced by maximizing the distance between solar energy development and the CRA.

- To the extent practicable, avoid ephemeral drainages, Palen Lake and Ford Dry Lake, and wetlands.

If these SEZ-specific design features are implemented in addition to other programmatic design features, impacts on amphibian and reptile species could be reduced. However, because potentially suitable habitats for a number of the amphibian and reptile species occur throughout much of the SEZ, additional species-specific mitigation of direct effects for those species would be difficult or infeasible.

9.4.11.2 Birds

9.4.11.2.1 Affected Environment

This section addresses bird species that are known to occur, or for which potentially suitable habitat occurs, on or within the potentially affected area of the proposed Riverside East SEZ. The list of bird species potentially present in the project area was determined from range maps and habitat information available from the California Wildlife Habitat Relationships System (CDFG 2008). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005, 2007). See Appendix M for additional information on the approach used.

More than 100 species of birds have a range that encompasses the proposed Riverside East SEZ region. However, habitats for about 40 of these species either do not occur on or are limited within the SEZ (e.g., habitat for waterfowl and wading birds). In addition, the SEZ region is only within the winter or summer range for some of the bird species. Eleven bird species that could occur on or in the affected area of the SEZ are considered focal species for the California Partners in Flight's *Desert Bird Conservation Plan* (CalPIF 2009): ash-throated flycatcher (*Myiarchus cinerascens*), black-tailed gnatcatcher (*Polioptila melanura*), black-throated sparrow (*Amphispiza bilineata*), burrowing owl (*Athene cunicularia*), common raven (*Corvus corax*), Costa's hummingbird (*Calypte costae*), crissal thrasher (*Toxostoma crissale*), ladder-backed woodpecker (*Picoides scalaris*), Le Conte's thrasher (*Toxostoma lecontei*), phainopepla (*Phainopepla nitens*), and verdin (*Auriparus flaviceps*). Habitats for most of these species are described in Table 9.4.11.2-1. The ash-throated flycatcher would be a summer resident within the SEZ, while the other desert focal bird species could occur year-round (CalPIF 2009).

> **Desert Focal Bird Species**
>
> Bird species whose requirements define spatial attributes, habitat characteristics, and management regimes representative of a healthy desert system (Chase and Geupel 2005).

Waterfowl, Wading Birds, and Shorebirds

As discussed in Section 4.10.2.2.2, waterfowl (ducks, geese, and swans), wading birds (herons and cranes), and shorebirds (avocets, gulls, plovers, rails, sandpipers, stilts, and terns) are among the most abundant groups of birds in the six-state study area. About 20 species of waterfowl, wading birds, and shorebirds occur within the SEZ region for the proposed Riverside

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TABLE 9.4.11.2-1 Representative Bird Species That Could Occur on or in the Affected Area of the Proposed Riverside East SEZ and Potential Impacts

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a]		Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
		Within SEZ (Direct Effects)[b]	Outside SEZ (Indirect Effects)[c]	
Shorebirds				
Killdeer (*Charadrius vociferus*)	Widespread throughout California. Open areas such as fields, meadows, lawns, mudflats, and shores. Nests on ground in open dry or gravelly locations. About 231,000 acres[f] of potentially suitable habitat occurs in the SEZ region. Year-round.	2,535 acres of potentially suitable habitat lost (1.1% of available potentially suitable habitat)	10,821 acres of potentially suitable habitat (4.7% of available potentially suitable habitat)	Moderate. Avoid development in Ford Dry Lake and Palen Lake. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Least sandpiper (*Calidris minutilla*)	Wet meadows, mudflats, flooded fields, lake shores, edge of salt marshes, and river sandbars. About 64,700 acres of potentially suitable habitat occurs in the SEZ region. Common to abundant in winter.	223 acres of potentially suitable habitat lost (0.3% of available potentially suitable habitat)	435 acres of potentially suitable habitat (0.7% of available potentially suitable habitat)	Small. Avoid development in Ford Dry Lake and Palen Lake. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 9.4.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Neotropical Migrants				
Ash-throated flycatcher (*Myiarchus cinerascens*)	Common in scrub and woodland habitats including desert riparian and desert washes. Requires hole/cavity for nesting. Uses shrubs or small trees for foraging perches. About 3,196,900 acres of potentially suitable habitat occurs in the SEZ region. Summer.	136,695 acres of potentially suitable habitat lost (4.3% of available potentially suitable habitat)	315,008 acres of potentially suitable habitat (9.9% of available potentially suitable habitat)	Moderate. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Black-tailed gnatcatcher (*Polioptila melanura*)	Nests in bushes mainly in wooded desert washes with dense mesquite, palo verde, ironwood, and acacia. Also occurs in desert scrub habitat. About 3,199,000 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	161,930 acres of potentially suitable habitat lost (5.1% of available potentially suitable habitat)	325,318 acres of potentially suitable habitat (10.2% of available potentially suitable habitat)	Moderate. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 9.4.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Neotropical Migrants (Cont.)				
Black-throated sparrow (*Amphispiza bilineata*)	Chaparral and desert scrub habitats with sparse to open stands of shrubs. Often in areas with scattered Joshua trees. Nests in thorny shrubs or cactus. About 2,960,000 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	162,473 acres of potentially suitable habitat lost (5.5% of available potentially suitable habitat)	394,738 acres of potentially suitable habitat (13.3% of available potentially suitable habitat)	Moderate. No species-specific mitigation of direct effects is feasible because suitable habitat is wide-spread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Brewer's sparrow (*Spizella breweri*)	Common in Mojave and Colorado Deserts during winter. Occupies open desert scrub and cropland habitats. About 2,305,900 acres of potentially suitable habitat occurs in the SEZ region.	111,544 acres of potentially suitable habitat lost (4.8% of available potentially suitable habitat)	243,705 acres of potentially suitable habitat (10.6% of available potentially suitable habitat)	Moderate. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 9.4.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Neotropical Migrants (Cont.)				
Cactus wren (*Campylorhynchus brunneicapillus*)	Desert (especially areas with cholla cactus or yucca), mesquite, arid scrub, coastal sage scrub, and trees in towns in arid regions. Nests in *Opuntia* spp.; twiggy, thorny trees and shrubs; and sometimes in buildings. Nests may be used as winter roost. Locally common in the Mojave and Colorado Deserts. About 1,865,100 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	30,616 acres of potentially suitable habitat lost (1.6% of available potentially suitable habitat)	195,594 acres of potentially suitable habitat (10.5% of available potentially suitable habitat)	Moderate. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Common poorwill (*Phalaenoptilus nuttallii*)	Scrubby and brushy areas, prairie, desert, rocky canyons, open woodlands, and broken forests. Mostly in arid and semiarid habitats. Nests in open areas on a bare site. About 4,125,500 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	142,112 acres of potentially suitable habitat lost (3.4% of available potentially suitable habitat)	430,448 acres of potentially suitable habitat (10.4% of available potentially suitable habitat)	Moderate. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Common raven (*Corvus corax*)	Occurs in most habitats. Trees and cliffs provide cover. Roosts primarily in trees. Nests on cliffs, bluffs, tall trees, or human-made structures. Forages in sparse, open terrain. About 2,692,700 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	112,684 acres of potentially suitable habitat lost (4.2% of available potentially suitable habitat)	245,576 acres of potentially suitable habitat (9.1% of available potentially suitable habitat)	Moderate. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 9.4.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Neotropical Migrants (Cont.)				
Costa's hummingbird (*Calypte costae*)	Desert and semidesert areas, arid brushy foothills, and chaparral. Main habitats are desert washes, edges of desert riparian and valley foothill riparian areas, coastal shrub, desert scrub, desert succulent shrub, low-elevation chaparral, and palm oasis. Also in mountains, meadows, and gardens during migration and winter. Most common in canyons and washes when nesting. Nests are located in trees, shrubs, vines, or cacti. About 3,196,700 acres of potentially suitable habitat occurs in the SEZ region. Common in summer and uncommon in winter in California.	136,473 acres of potentially suitable habitat lost (4.3% of available potentially suitable habitat)	315,008 acres of potentially suitable habitat (9.8% of available potentially suitable habitat)	Moderate. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Greater roadrunner (*Geococcyx californianus*)	Desert scrub, chaparral, edges of cultivated lands, and arid open areas with scattered brush. Requires thickets, large bushes, or small trees for shade, refuge, and roosting. Usually nests low in trees, shrubs, or clumps of cactus. Rarely nests on ground. About 4,413,300 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	162,473 acres of potentially suitable habitat lost (3.7% of available potentially suitable habitat)	459,771 acres of potentially suitable habitat (10.4% of available potentially suitable habitat)	Moderate. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 9.4.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Neotropical Migrants (Cont.)				
Horned lark (*Eremophila alpestris*)	Common to abundant resident in a variety of open habitats. Breeds in grasslands, sagebrush, semidesert shrublands, and alpine tundra. During migration and winter, inhabits the same habitats other than tundra, and also occurs in agricultural areas. Usually occurs where plant density is low and there are exposed soils. About 2,378,200 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	111,496 acres of potentially suitable habitat lost (4.7% of available potentially suitable habitat)	235,350 acres of potentially suitable habitat (9.9% of available potentially suitable habitat)	Moderate. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
House finch (*Carpodacus mexicanus*)	Variety of areas including arid scrub and brush, desert riparian areas, open woodlands, cultivated lands, and savannas. Usually forages in areas with elevated escape perches (e.g., trees, tall shrubs, transmission lines, and buildings). Roosts and nests in sheltered sites in trees; tall, dense shrubs; man-made structures; cliff crevices; or earthen banks. About 142,900 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	1,188 acres of potentially suitable habitat lost (0.8% of available potentially suitable habitat)	9,900 acres of potentially suitable habitat (6.9% of available potentially suitable habitat)	Small. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Ladder-backed woodpecker (*Picoides scalaris*)	Fairly common in Mojave and Colorado Deserts. Variety of habitats including deserts, arid scrub, riparian woodlands, mesquite, scrub oak, pinyon-juniper woodlands. Digs nest hole in rotted stub or dead or dying branches of various trees. Also nests in saguaro, agave, yucca, fence posts, and utility poles. Nests on ledges; branches of trees, shrubs, and cactus; and holes in trees or walls. About 3,196,800 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	136,695 acres of potentially suitable habitat lost (4.3% of available potentially suitable habitat)	315,008 acres of potentially suitable habitat (9.9% of available potentially suitable habitat)	Moderate. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 9.4.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Neotropical Migrants (Cont.)				
Le Conte's thrasher (*Toxostoma leconteii*)	Open desert wash, alkali desert scrub, and desert succulent shrub habitats. Prefers to nest and forage in arroyos and washes lined with dense stands of creosotebush and salt bush. About 3,197,700 acres of potentially suitable habitat occurs in the SEZ region. Year-round, but uncommon to rare.	161,930 acres of potentially suitable habitat lost (5.1% of available potentially suitable habitat)	325,566 acres of potentially suitable habitat (10.2% of available potentially suitable habitat)	Moderate. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 9.4.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Neotropical Migrants (Cont.)				
Lesser nighthawk (*Chordeiles acutipennis*)	Open country, desert regions, scrub, savanna, and cultivated areas. Usually near water including open marshes, salt ponds, large rivers, rice paddies, and beaches. Roosts on low perches or the ground. Nests in the open on bare sites. About 4,603,400 acres of potentially suitable habitat occurs in the SEZ region. Uncommon summer resident.	162,473 acres of potentially suitable habitat lost (3.5% of available potentially suitable habitat)	594,861 acres of potentially suitable habitat (12.9% of available potentially suitable habitat)	Moderate. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Loggerhead shrike (*Lanius ludovicianus*)	Open country with scattered trees and shrubs, savanna, desert scrub, desert riparian, Joshua tree, and occasionally, open woodland habitats. Perches on poles, wires, or fence posts (suitable hunting perches are important aspect of habitat). Nests in shrubs and small trees. About 3,336,200 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	137,593 acres of potentially suitable habitat lost (4.1% of available potentially suitable habitat)	324,251 acres of potentially suitable habitat (9.7% of available potentially suitable habitat)	Moderate. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 9.4.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Neotropical Migrants (Cont.)				
Phainopepla (*Phainopepla nitens*)	Common in Mojave and Colorado Deserts. Desert scrub, mesquite, juniper and oak woodlands, tall brush, washes, riparian woodlands, and orchards. Nests in dense foliage of large shrubs or trees, sometimes in a clump of mistletoe. About 1,113,000 acres of potentially suitable habitat occurs in the SEZ region. Year-round, but many move to more western and northern portions of California during summer.	51,997 acres of potentially suitable habitat lost (4.7% of available potentially suitable habitat)	95,893 acres of potentially suitable habitat (8.6% of available potentially suitable habitat)	Moderate. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Say's phoebe (*Sayornis saya*)	Arid open country, deserts, sagebrush plains, dry barren foothills, canyons, cliffs, ranches, and rural homes. Nests in cliff crevices, holes in banks, sheltered ledges, tree cavities, under bridges and roofs, and in mines. About 3,359,000 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	118,034 acres of potentially suitable habitat lost (3.5% of available potentially suitable habitat)	360,289 acres of potentially suitable habitat (10.7% of available potentially suitable habitat)	Moderate. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Verdin (*Auriparus flaviceps*)	Common to abundant in Colorado Desert, less common in Mojave Desert. Desert riparian, desert wash, desert scrub, and alkali desert scrub areas with large shrubs and small trees. Nests in shrubs, small trees, or cactus. About 3,232,000 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	135,132 acres of potentially suitable habitat lost (4.2% of available potentially suitable habitat)	309,905 acres of potentially suitable habitat (9.6% of available potentially suitable habitat)	Moderate. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.

TABLE 9.4.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Neotropical Migrants (Cont.)				
White-throated swift (*Aeronautes saxatalis*)	Mountainous country near cliffs and canyons where breeding occurs. Forages over forest and open situations. Nests in rock crevices and canyons, sometimes in buildings. Ranges widely over most terrain and habitats, usually high in the air. About 1,027,900 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	6,828 acres of potentially suitable habitat lost (0.7% of available potentially suitable habitat)	125,922 acres of potentially suitable habitat (12.3% of available potentially suitable habitat)	Small. Some measure of mitigation provided by the requirements of the Migratory Bird Treaty Act.
Birds of Prey				
American kestrel (*Falco sparverius*)	Occurs in most open habitats, in various shrub and early successional forest habitats, forest openings, and various ecotones. Perches on trees, snags, rocks, utility poles and wires, and fence posts. Uses cavities in trees, snags, rock areas, banks, and buildings for nesting and cover. About 1,774,600 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	37,970 acres of potentially suitable habitat lost (2.1% of available potentially suitable habitat)	266,637 acres of potentially suitable habitat (15.0% of available potentially suitable habitat)	Moderate

TABLE 9.4.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Birds of Prey (cont.)				
Golden eagle (*Aquila chrysaetos*)	Grasslands, shrublands, pinyon-juniper woodlands, and ponderosa pine forests. Occasionally in most other habitats, especially during migration and winter. Nests on cliffs and sometimes trees in rugged areas, with breeding birds ranging widely over surrounding areas. About 4,645,700 acres of potentially suitable habitat occurs in the SEZ region. Winter.	162,473 acres of potentially suitable habitat lost (3.5% of available potentially suitable habitat)	566,888 acres of potentially suitable habitat (12.2% of available potentially suitable habitat)	Moderate. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects. Some measure of mitigation provided by the requirements of the Bald and Golden Eagle Protection Act.
Prairie falcon (*Falco mexicanus*)	Associated primarily with perennial grasslands, savannahs, rangeland, some agricultural fields, and desert scrub areas. Nests in potholes or well-sheltered ledges on rocky cliffs or steep earth embankments. May also nest in man-made excavations on otherwise unsuitable cliffs and old nests of ravens, hawks, and eagles. Forages in large patch areas with low vegetation. May forage over irrigated croplands in winter. About 4,161,000 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	140,549 acres of potentially suitable habitat lost (3.4% of available potentially suitable habitat)	425,345 acres of potentially suitable habitat (10.2% of available potentially suitable habitat)	Moderate

TABLE 9.4.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a] Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a] Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Birds of Prey (Cont.)				
Red-tailed hawk (*Buteo jamaicensis*)	Wide variety of habitats from deserts, mountains, and populated valleys. Open areas with scattered, elevated perch sites such as scrub desert, plains and montane grassland, agricultural fields, pastures, urban parklands, broken coniferous forests, and deciduous woodland. Nests on cliff ledges or in tall trees. About 433,400 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	2,461 acres of potentially suitable habitat lost (0.6% of available potentially suitable habitat)	14,594 acres of potentially suitable habitat (3.4% of available potentially suitable habitat)	Small
Turkey vulture (*Cathartes aura*)	Occurs in open stages of most habitats that provide adequate cliffs or large trees for nesting, roosting, and resting. Migrates and forages over most open habitats. Will roost communally in trees, exposed boulders, and occasionally transmission line support towers. About 3,372,500 acres of potentially suitable habitat occurs in the SEZ region. Summer.	117,359 acres of potentially suitable habitat lost (3.5% of available potentially suitable habitat)	351,380 acres of potentially suitable habitat (10.4% of available potentially suitable habitat)	Moderate
Upland Game Birds				
Gambel's quail (*Callipepla gambelii*)	Deserts, especially in areas with brushy or thorny growth, and adjacent cultivated areas. Usually occurs near water. Nests on the ground under cover of small trees, shrubs, and grass tufts. About 4,158,700 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	142,335 acres of potentially suitable habitat lost (3.4% of available potentially suitable habitat)	430,704 acres of potentially suitable habitat (10.4% of available potentially suitable habitat)	Moderate

TABLE 9.4.11.2-1 (Cont.)

Common Name (Scientific Name)	Habitat and Seasonal Occurrence	Maximum Area of Potential Habitat Affected[a] Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a] Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Upland Game Birds (Cont.)				
Mourning dove (*Zenaida macroura*)	Habitat generalist, occurring in grasslands, shrublands, croplands, lowland and foothill riparian forests, ponderosa pine forests, deserts, and urban and suburban areas. Rarely in aspen and other forests, coniferous woodlands, and alpine tundra. Nests on ground or in trees. Winters mostly in lowland riparian forests adjacent to cropland. About 3,426,600 acres of potentially suitable habitat occurs in the SEZ region. Year-round.	139,253 acres of potentially suitable habitat lost (4.1% of available potentially suitable habitat)	329,063 acres of potentially suitable habitat (9.6% of available potentially suitable habitat)	Moderate
White-winged dove (*Zenaida asiatica*)	Desert riparian, wash, succulent shrub, scrub, and Joshua tree habitats; orchards and vineyards, croplands, and pastures. About 3,266,300 acres of potentially suitable habitat occurs in the SEZ region. Summer.	162,473 acres of potentially suitable habitat lost (5.0% of available potentially suitable habitat)	330,669 acres of potentially suitable habitat (10.1% of available potentially suitable habitat)	Moderate. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effects.

[a] Maximum area of potentially suitable habitat affected relative to total available potentially suitable habitat within the SEZ region (i.e., a 50-mi [80-km] radius from the center of the SEZ). Habitat availability was determined from potentially suitable land cover for each species (USGS 2004, 2005, 2007).

[b] Direct effects within the SEZ consist of ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations. A maximum of 162,473 acres would be developed in the SEZ.

Footnotes continued on next page.

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TABLE 9.4.11.2-1 (Cont.)

[c] The area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary. Indirect effects include effects from surface runoff, dust, noise, lighting, etc. from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance from the SEZ boundary.

[d] Overall impact magnitude categories were based on professional judgment and were (1) *small*: ≤1% of potentially suitable habitat for the species would be lost and the activity would not result in a measurable change in the carrying capacity or population size in the affected area; (2) *moderate*: >1 but ≤10% of potentially suitable habitat for the species would be lost and the activity would potentially result in a measurable but moderate (not destabilizing) change in the carrying capacity or population size in the affected area; and (3) *large*: >10% of potentially suitable habitat for the species would be lost and the activity would result in a potentially large, measurable, and destabilizing change in the carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects, because those effects would be difficult to mitigate. Programmatic design features would reduce most indirect effects to negligible levels.

[e] Species-specific mitigation is presented for those species that have particular habitat features that could be readily avoided. For species or individuals occurring outside the SEZ (in the area of indirect effects), no mitigation measures beyond required programmatic design features have been identified.

[f] To convert acres to km^2, multiply by 0.004047.

Sources: CDFG (2008); NatureServe (2010); USGS (2004, 2005, 2007).

East SEZ. Within the SEZ, waterfowl, wading birds, and shorebirds are uncommon because of the lack of aquatic habitat, but occur within the area of the CRA just northwest of the SEZ. The killdeer (*Charadrius vociferus*) and least sandpiper (*Calidris minutilla*) (shorebird species) would be expected to occur on the SEZ, especially when Ford Dry Lake and Palen Lake contain standing water. The Colorado River, located more than 5 mi (8 km) east of the SEZ, and the Salton Sea, located more than 31 mi (50 km) southwest of the SEZ, would provide more productive habitat for this group of birds.

Neotropical Migrants

As discussed in Section 4.10.2.2.3, neotropical migrants represent the most diverse category of birds within the six-state study area. Neotropical migrants expected to occur on or in the affected area of the proposed Riverside East SEZ throughout the year include the black-tailed gnatcatcher, black-throated sparrow, cactus wren (*Campylorhynchus brunneicapillus*), common poorwill (*Phalaenoptilus nuttallii*), common raven, Costa's hummingbird, crissal thrasher, greater roadrunner (*Geococcyx californianus*), horned lark (*Eremophila alpestris*), house finch (*Carpodacus mexicanus*), ladder-backed woodpecker, Le Conte's thrasher, loggerhead shrike (*Lanius ludovicianus*), phainopepla, Say's phoebe (*Sayornis saya*), verdin, and white-throated swift (*Aeronautes saxatalis*). The winter range for the Brewer's sparrow (*Spizella breweri*), green-tailed towhee (*Pipilo chlorurus*), and sage sparrow (*Amphispiza belli*) encompasses the SEZ, while the summer range for the ash-throated flycatcher (*Myiarchus cinerascens*) and lesser nighthawk (*Chordeiles acutipennis*) encompasses the SEZ (CDFG 2008).

Birds of Prey

Section 4.10.2.2.4 provides an overview of the birds of prey (raptors, owls, and vultures) within the six-state study area. Seventeen bird of prey species have ranges that encompass the proposed Riverside East SEZ (CDFG 2008). Raptor species expected to occur within the SEZ include the American kestrel (*Falco sparverius*, year-round), burrowing owl (year-round), ferruginous hawk (*Buteo regalis*, winter), golden eagle (*Aquila chrysaetos*, winter), prairie falcon (*Falco mexicanus*, year-round), red-tailed hawk (*Buteo jamaicensis*, year-round), and turkey vulture (*Cathartes aura*, summer) (CDFG 2008). However, the American kestrel, golden eagle, prairie falcon, and red-tailed hawk make only infrequent use of the desert regions within which the Riverside East SEZ occurs. The golden eagle is a Fully Protected species by the State of California (CDFG 2010b).

Upland Game Birds

Section 4.10.2.2.5 provides an overview of the upland game birds (primarily pheasants, grouse, quail, and doves) that occur within the six-state study area. Upland game species that could occur year-round within the proposed Riverside East SEZ are Gambel's quail (*Callipepla gambelii*) and mourning dove (*Zenaida macroura*), while the white-winged dove (*Zenaida asiatica*) would occur during the summer (CDFG 2008). Gambel's quail is common within the

Colorado and Mojave Desert areas of California. It prefers riparian areas and also occurs near streams, springs, and water holes. While it feeds in open habitats, trees or tall shrubs are required for escape cover. It also requires a nearby source of water, particularly during hot summer months (CDFG 2008). Up to 400,000 Gambel's quail are harvested annually in California (CDFG 2008). The mourning dove is common throughout California and can be found in a wide variety of habitats. Regardless of habitat occupied, it requires a nearby water source (CDFG 2008). The white-winged dove occurs in the southeastern corner of California. It inhabits desert riparian, wash, succulent shrub, scrub, alkali scrub, and Joshua tree habitats. It also occurs in orchards, vineyards, cropland, and pastures (CDFG 2008).

Table 9.4.11.2-1 provides habitat information for the representative bird species that could occur on the affected area of the proposed Riverside East SEZ. Because of their special status standing, the burrowing owl, crissal thrasher, ferruginous hawk, and short-eared owl are discussed in Section 9.4.12.1.

9.4.11.2.2 Impacts

The types of impacts that birds could incur from construction, operation, and decommissioning of utility-scale solar energy facilities are discussed in Section 5.10.2.2. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through any additional mitigation applied. Section 9.4.11.2.3, below, identifies design features of particular relevance to the proposed Riverside East SEZ.

The assessment of impacts on bird species is based on available information on the presence of species in the affected area as presented in Section 9.4.11.2.1, following the analysis approach described in Appendix M. Additional NEPA assessments and coordination with state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid or mitigate impacts on birds (see Section 9.4.11.2.3).

In general, impacts on birds would result from habitat disturbance (i.e., habitat reduction, fragmentation, and alteration) and from disturbance, injury, or mortality to individual birds. Table 9.4.11.2-1 summarizes the potential impacts on representative bird species resulting from solar energy development that could occur on or in the affected area in the proposed Riverside East SEZ. Direct impacts on representative bird species would be small for the least sandpiper, house finch, white-throated sparrow, and red-tailed hawk, because 0.3 to 0.8% of habitats potentially suitable for the species would be lost (Table 9.4.11.2-1). Moderate direct impacts on the other representative bird species would occur, with loss of potentially suitable habitats ranging from 1.1 to 5.5% (Table 9.4.11.2-1). Larger areas of potentially suitable habitat for the birds occur within the area of potential indirect effects (e.g., up to 15.0% of potentially suitable habitat for the American kestrel). Other impacts on birds could result from collision with vehicles and structures, surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, noise, lighting, spread of invasive species, accidental spills, and harassment. Indirect impacts on areas outside the SEZ (e.g., impacts caused by dust generation, erosion, and sedimentation) are expected to be negligible with implementation of programmatic design features.

Decommissioning of facilities and reclamation of disturbed areas after operations cease could result in short-term negative impacts on individuals and habitats adjacent to project areas, but long-term benefits would accrue if suitable habitats in previously disturbed areas were restored. Section 5.10.2.1.4 provides an overview of the impacts of decommissioning and reclamation on wildlife. Of particular importance for reptile species would be the restoration of original ground surface contours, soils, and native plant communities associated with semiarid shrublands.

9.4.11.2.3 SEZ-Specific Design Features and Design Feature Effectiveness

The successful implementation of programmatic design features presented in Appendix A, Section A.2.2, would reduce the potential for effects on birds, especially for those species that depend on habitat types that can be avoided (e.g., ephemeral drainages, Ford Dry Lake and Palen Lake, wetlands, and the CRA). Indirect impacts could be reduced to negligible levels by implementing programmatic design features, especially those engineering controls that would reduce runoff, sedimentation, spills, and fugitive dust. While SEZ-specific design features important to reducing impacts on birds are best established when project details are considered, some design features can be identified at this time, as follows:

- Pre-disturbance surveys should be conducted within the SEZ for bird species listed under the Migratory Bird Treaty Act, including those species considered to be desert bird focal species. Nesting habitat for bird species listed under the Migratory Bird Treaty Act should be avoided during the nesting season.

- Plant species that positively influence the presence and abundance of the desert bird focal species should be avoided to the extent practicable. These species include Goodding’s willow, yucca, Joshua tree, mesquite, honey mesquite, screwbean, desert mistletoe, big saltbush, smoketree, and catclaw acacia (CalPIF 2009).

- Take of golden eagles and other raptors should be avoided. Mitigation regarding the golden eagle should be developed in consultation with the USFWS and CDFG. A permit may be required under the Bald and Golden Eagle Protection Act.

- To the extent practicable, avoid ephemeral drainages, Ford Dry Lake and Palen Lake, wetlands, and the CRA.

If these SEZ-specific design features are implemented in addition to programmatic project design features, impacts on bird species could be reduced. Any residual impacts on birds are anticipated to be small given the relative abundance of suitable habitats in the SEZ region. However, as potentially suitable habitats for a number of the bird species occur throughout much of the SEZ, additional species-specific mitigation of direct effects for those species would be difficult or infeasible. The potential for indirect impacts on several bird species (particularly waterfowl, wading birds, and shorebirds) could be reduced by maximizing the distance between solar energy facilities and the CRA.

9.4.11.3 Mammals

9.4.11.3.1 Affected Environment

This section addresses mammal species that are known to occur, or for which suitable habitat occurs, on or within the potentially affected area of the Riverside East SEZ. The list of mammal species potentially present in the project area was determined from range maps and habitat information available from the California Wildlife Habitat Relationships System (CDFG 2008). Land cover types suitable for each species were determined from SWReGAP (USGS 2004, 2005, 2007). See Appendix M for additional information on the approach used. Based on species distributions and habitat preferences, more than 40 mammal species could occur within the SEZ (CDFG 2008). The following discussion emphasizes big game and other mammal species that (1) have key habitats within or near the Riverside East SEZ, (2) are important to humans (e.g., big game, small game, and furbearer species), and/or (3) are representative of other species that share similar habitats.

Big Game

The cougar (*Puma concolor*)[4], desert bighorn sheep (*Ovis canadensis nelsoni*), and mule deer (*Odocoileus hemionus*) are the big game species whose ranges encompass the area of the proposed Riverside East SEZ. The cougar inhabits cliffs, forests, woodlands, shrublands, chaparral, and deserts. It generally occurs in mountainous or remote undisturbed areas. However, it also occurs in a variety of other habitats, including swamps, riparian woodlands, and broken country with brush or woodland cover. Habitat areas of more than 500,000 acres (2,000 km^2) are needed for long-term population survival, and protection of immigration corridors is also desirable (NatureServe 2010). The cougar is generally absent from desert areas that do not support mule deer. Its seasonal movements are generally in response to following migrating deer herds. There are possibly more than 5,000 cougar in California with the numbers apparently increasing (CDFG 2008).

[4] Although cougar hunting does not occur in California, it is included with big game for the sake of continuity with the SEZ wildlife sections for the other five states.

Because it is a BLM sensitive species, the desert bighorn sheep is discussed in Section 9.4.12.

The mule deer is common to abundant throughout California, except in deserts and intensely farmed areas (CDFG 2008). It prefers a mosaic of vegetation that has herbaceous openings, dense brush or tree thickets, riparian areas, and abundant edges. Mule deer are browsers and grazers, feeding on shrubs, forbs, and a few grasses. Brush is important for escape cover and for thermal regulation in winter and summer (CDFG 2008). The burro deer (*Odocoileus hemionus eremicus*), a subspecies of mule deer, occurs in the Colorado Desert. It occurs primarily along the Colorado River, especially during hot summers, and in desert wash woodland communities when away from the river (generally when late summer thunderstorms and cooler temperatures allow the deer to move up the larger washes into the mountains or wash complexes in the foothills) (BLM and CDFG 2002). Burro deer consume foliage from riparian and woodland trees (e.g., willow, palo verde, and ironwood) and various shrubs. Major threats to the burro deer include habitat loss from agricultural development and urbanization and infestation of tamarisk along the Colorado River (BLM and CDFG 2002).

Other Mammals

A number of small game and furbearer species occur within the area of the proposed Riverside East SEZ: the American badger (*Taxidea taxus*), black-tailed jackrabbit (*Lepus californicus*), bobcat (*Lynx rufus*), coyote (*Canis latrans*), desert cottontail (*Sylvilagus audubonii*), round-tailed ground squirrel (*Spermophilus tereticaudus*), and white-tailed antelope squirrel (*Ammospermophilus leucurus*) (CDFG 2008).

Nongame (small) mammal species, such as bats, mice, kangaroo rats, and shrews, also occur within the area of the Riverside East SEZ: the cactus mouse (*Peromyscus eremicus*), canyon deermouse (*P. crinitus*), desert kangaroo rat (*Dipodomys deserti*), desert shrew (*Notiosorex crawfordi*), desert woodrat (*Neotoma lepida*), little pocket mouse (*Perognathus longimembris*), long-tailed pocket mouse (*Chaetodipus formosus*), Merriam's kangaroo rat (*Dipodomys merriami*), and southern grasshopper mouse (*Onychomys torridus*) (CDFG 2008). The ranges of nine bat species encompass the SEZ: big brown bat (*Eptesicus fuscus*), Brazilian free-tailed bat (*Tadarida brasiliensis*), Californian leaf-nosed bat (*Macrotus californicus*), California mastiff bat (*Eumops perotis californicus*), California myotis (*Myotis californicus*), pallid bat (*Antrozous pallidus*), spotted bat (*Euderma maculatum*), Townsend's big-eared bat (*Corynorhinus townsendii*), and western pipistrelle (*Parastrellus hesperus*). Most bat species would utilize the SEZ only during foraging. Roost sites for the species (e.g., caves, hollow trees, rock crevices, or buildings) are absent to scarce on or in the affected area of the SEZ.

Table 9.4.11.3-1 provides habitat information for the representative mammal species that could occur on or in the affected area of the Riverside East SEZ. Because of their special status standing, the California mastiff bat, Californian leaf-nose bat, pallid bat, and Townsend's big-eared bat are discussed in Section 9.4.12.

9.4.11.3.2 Impacts

The types of impacts that mammals could incur from construction, operation, and decommissioning of utility-scale solar energy facilities are discussed in Section 5.10.2.3. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through any additional mitigation applied. Section 9.4.11.3.3, below, identifies design features of particular relevance to the proposed Riverside East SEZ.

The assessment of impacts on mammal species is based on available information on the presence of species in the affected area as presented in Section 9.4.11.3.1, following the analysis approach described in Appendix M. Additional NEPA assessments and coordination with state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid or mitigate impacts on mammals (see Section 9.4.11.3.3).

Table 9.4.11.3-1 summarizes the potential impacts on representative mammal species resulting from solar energy development (with the implementation of required programmatic design features) in the proposed Riverside East SEZ.

Although the Riverside East SEZ falls within the overall range of the cougar, desert habitat is not the preferred habitat for the species. It is unlikely that impacts from solar energy development within the SEZ would represent an actual loss of occupied habitat, although direct impacts could occur to 117,359 acres (474.9 km^2), about 3.3%, of potentially suitable habitat within the SEZ region (Table 9.4.11.3-1).

Mule deer would occur near the Colorado River most of the year, particularly during the hot summer months. However, the species could occur within the desert scrub and desert wash habitats of the SEZ for portions of the year, particularly when standing water occurs in Ford Dry Lake and Palen Lake. Almost 162,500 acres (658 km^2) of potentially suitable mule deer habitat could be directly affected by solar energy development on the proposed Riverside East SEZ (Table 9.4.11.3-1). Fencing around a large solar development within the SEZ could affect movement of mule deer between the Colorado River and mountains or foothills.

TABLE 9.4.11.3-1 Representative Mammal Species That Could Occur on or in the Affected Area of the Proposed Riverside East SEZ and Potential Impacts

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a] Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a] Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Big Game				
Cougar (*Puma concolor*)	Widespread, uncommon permanent resident in California. Most common in rough, broken foothills and canyon country, often in association with montane forests, shrublands/chaparral, and pinyon-juniper woodlands. Also occurs in deserts, swamps, and riparian area. Seeks cover in caves, other natural cavities, and thickets in brush and timber. About 3,508,100 acres[f] of potentially suitable habitat occurs in the SEZ region.	117,359 acres of potentially suitable habitat lost (3.3% of available potentially suitable habitat)	351,380 acres of potentially suitable habitat (10.0% of available potentially suitable habitat)	Moderate
Mule deer (*Odocoileus hemionus*)	Occurs in early to intermediate successional stages of most forest, woodland, and brush habitats. About 3,433,200 acres of potentially suitable habitat occurs in the SEZ region.	162,473 acres of potentially suitable habitat lost (4.7% of available potentially suitable habitat)	335,963 acres of potentially suitable habitat (9.8% of available potentially suitable habitat)	Moderate. Ensure that fencing does not block the free passage of mule deer between the Colorado River and mountains or foothills.
Small Game and Furbearers				
American badger (*Taxidea taxus*)	Open grasslands and deserts, meadows in subalpine and montane forests, alpine tundra. Dig burrows in friable soils. Most common in areas with abundant populations of ground squirrels, prairie dogs, and pocket gophers. Relatively uncommon throughout California. About 2,502,700 acres of potentially suitable habitat occurs in the SEZ region.	110,156 acres of potentially suitable habitat lost (4.4% of available potentially suitable habitat)	230,581 acres of potentially suitable habitat (9.2% of available potentially suitable habitat)	Moderate

TABLE 9.4.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a] Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a] Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Small Game and Furbearers (Cont.)				
Black-tailed jackrabbit (*Lepus californicus*)	Open plains, fields, and deserts with scattered thickets or patches of shrubs. Also open, early stages of forests and chaparral habitats. Rests during the day in shallow depressions, and uses shrubs for cover. About 4,065,600 acres of potentially suitable habitat occurs in the SEZ region.	162,473 acres of potentially suitable habitat lost (4.0% of available potentially suitable habitat)	450,831 acres of potentially suitable habitat (11.1% of available potentially suitable habitat)	Moderate. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Bobcat (*Lynx rufus*)	Occurs in nearly all habitats and successional stages. Optimal habitats include mixed woodlands and forest edges, hardwood forests, swamps, forested river bottoms, brushlands, deserts, mountains, and other area with thick undergrowth. Availability of water may limit its distribution in xeric regions. Uses rocky clefts, caves, hollow logs, spaces under fallen trees, and so forth when inactive; usually changes shelter areas daily. About 2,951,800 acres of potentially suitable habitat occurs in the SEZ region.	136,053 acres of potentially suitable habitat lost (4.6% of available potentially suitable habitat)	322,483 acres of potentially suitable habitat (10.9% of available potentially suitable habitat)	Moderate
Coyote (*Canis latrans*)	Suitable habitat characterized by interspersions of brush and open areas with free water. Least common in dense coniferous forest. Where human control efforts occur, it is restricted to broken, rough country with abundant shrub cover and a good supply of rabbits or rodents. About 4,822,200 acres of potentially suitable habitat occurs in the SEZ region.	162,473 acres of potentially suitable habitat lost (3.4% of available potentially suitable habitat)	605,581 acres of potentially suitable habitat (12.6% of available potentially suitable habitat)	Moderate. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 9.4.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a] Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a] Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Small Game and Furbearers (Cont.)				
Desert cottontail (*Sylvilagus audubonii*)	Abundant to common in grasslands, open forests, and desert shrub habitats. Can occur in areas with minimal vegetation as long as adequate cover (e.g., rock piles, fallen logs, fence rows) is present. Thickets and patches of shrubs, vines, and brush also used as cover. About 3,233,000 acres of potentially suitable habitat occurs in the SEZ region.	136,030 acres of potentially suitable habitat lost (4.2% of available potentially suitable habitat)	318,574 acres of potentially suitable habitat (9.9% of available potentially suitable habitat)	Moderate
Round-tailed ground squirrel (*Spermophilus tereticaudus*)	Optimum habitat includes desert succulent shrub, desert wash, desert scrub, alkali desert scrub, and levees in cropland habitat. Also occurs in urban habitats. Burrows usually at base of shrubs. About 2,558,600 acres of potentially suitable habitat occurs in the SEZ region.	111,719 acres of potentially suitable habitat lost (4.4% of available potentially suitable habitat)	235,684 acres of potentially suitable habitat (9.2% of available potentially suitable habitat)	Moderate
White-tailed antelope squirrel (*Ammospermophilus leucurus*)	Common to abundant in California deserts. Optimal habitats are desert scrub, sagebrush, alkali desert scrub, Joshua tree, bitterbrush, and pinyon-juniper. Fairly common in desert riparian, desert succulent shrub, and desert wash habitats. Also occurs in mixed chaparral and annual grassland habitats. Requires friable soil for burrowing. Burrows may be under shrubs or in open, often uses abandoned kangaroo rat burrows. About 4,053,800 acres of potentially suitable habitat occurs in the SEZ region.	140,549 acres of potentially suitable habitat lost (3.5% of available potentially suitable habitat)	425,267 acres of potentially suitable habitat (10.5% of available potentially suitable habitat)	Moderate

TABLE 9.4.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a] Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a] Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Nongame (Small) Mammals				
Big brown bat (*Eptesicus fuscus*)	Deserts, forests and woodlands, old fields, shrublands, and urban/suburban areas. Uncommon in hot desert habitats. Summer roosts are in buildings, hollow trees, rock crevices, tunnels, and cliff swallow nests. Maternity colonies occur in attics, barns, tree cavities, rock crevices, and caves. Caves, mines, and man-made structures used for hibernation sites. About 3,578,200 acres of potentially suitable habitat occurs in the SEZ region.	116,538 acres of potentially suitable habitat lost (3.3% of available potentially suitable habitat)	355,936 acres of potentially suitable habitat (9.4% of available potentially suitable habitat)	Moderate
Brazilian free-tailed bat (*Tadarida brasiliensis*)	Cliffs, deserts, grasslands, old fields, savannas, shrublands, woodlands, and suburban/urban areas. Roosts in buildings, caves, and hollow trees. May roost in rock crevices, bridges, signs, or cliff swallow nests during migration. Large maternity colonies inhabit caves, buildings, culverts, and bridges. About 4,291,600 acres of potentially suitable habitat occurs in the SEZ region.	162,473 acres of potentially suitable habitat lost (3.8% of available potentially suitable habitat)	451,224 acres of potentially suitable habitat (10.5% of available potentially suitable habitat)	Moderate. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Cactus mouse (*Peromyscus eremicus*)	Deserts, shrublands, chaparral, and coniferous woodlands. Occurs on rocky areas and areas with sandy substrates and loamy soils. Nests in rock heaps, stone walls, burrows, brush fences, and woodrat houses. About 3,209,200 acres of potentially suitable habitat occurs in the SEZ region.	136,695 acres of potentially suitable habitat lost (4.3% of available potentially suitable habitat)	315,008 acres of potentially suitable habitat (9.8% of available potentially suitable habitat)	Moderate

TABLE 9.4.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a] Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a] Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Nongame (Small) Mammals (Cont.)				
Californian myotis (*Myotis californicus*)	Cliffs, deserts, forests, woodlands, grasslands, savannas, shrublands, and savannas. Often uses man-made structures for night roosts. Uses crevices for summer day roosts. May roost on small desert shrubs or on the ground. Hibernates in caves, mines, tunnels, or buildings. Maternity colonies in rock crevices, under bark, or under eaves of buildings. Common to abundant below 6,000 ft. About 4,078,900 acres of potentially suitable habitat occurs in the SEZ region.	140,772 acres of potentially suitable habitat lost (3.5% of available potentially suitable habitat)	425,353 acres of potentially suitable habitat (10.4% of available potentially suitable habitat)	Moderate
Canyon deermouse (*Peromyscus crinitus*)	Found in most desert and chaparral habitats. Gravelly desert pavement, talus, boulders, cliffs, and slickrock—rocky areas with virtually any type of plant cover. About 2,898,300 acres of potentially suitable habitat occurs in the SEZ region.	141,075 acres of potentially suitable habitat lost (4.9% of available potentially suitable habitat)	371,040 acres of potentially suitable habitat (12.8% of available potentially suitable habitat)	Moderate
Desert kangaroo rat (*Dipodomys deserti*)	Low deserts, deep wind-drifted sandy soil with sparse vegetation, alkali sinks, and shadscale or creosote bush scrub. Nests in burrows dug in mounds, usually under vegetation. About 722,200 acres of potentially suitable habitat occurs in the SEZ region.	51,774 acres of potentially suitable habitat lost (7.2% of available potentially suitable habitat)	95,311 acres of potentially suitable habitat (13.2% of available potentially suitable habitat)	Moderate

TABLE 9.4.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a]		Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
		Within SEZ (Direct Effects)[b]	Outside SEZ (Indirect Effects)[c]	
Nongame (Small) Mammals (Cont.)				
Desert shrew (*Notiosorex crawfordi*)	Generally found in arid areas with adequate cover for nesting and resting. Deserts, semiarid grasslands with scattered cactus and yucca, chaparral slopes, alluvial fans, sagebrush, gullies, juniper woodlands, riparian areas, and dumps. About 4,334,000 acres of potentially suitable habitat occurs in the SEZ region.	162,473 acres of potentially suitable habitat lost (3.7% of available potentially suitable habitat)	446,691 acres of potentially suitable habitat (10.3% of available potentially suitable habitat)	Moderate. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Desert woodrat (*Neotoma lepida*)	Sagebrush scrub; chaparral; deserts and rocky slopes with scattered cactus, yucca, pine-juniper, or other low vegetation; creosotebush desert; Joshua tree woodlands; scrub oak woodlands, pinyon-juniper woodlands; and riparian zones. Most abundant in rocky areas with Joshua trees. Dens built of debris on ground, among cacti or yucca, along cliffs, among rocks, or occasionally in trees. About 4,546,200 acres of potentially suitable habitat occurs in the SEZ region.	162,473 acres of potentially suitable habitat lost (3.6% of available potentially suitable habitat)	579,200 acres of potentially suitable habitat (12.7% of available potentially suitable habitat)	Moderate. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 9.4.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a]		Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
		Within SEZ (Direct Effects)[b]	Outside SEZ (Indirect Effects)[c]	
Nongame (Small) Mammals (Cont.)				
Little pocket mouse (*Perognathus longimembris*)	Common to abundant in southern California deserts. Preferred habitat includes desert riparian, desert scrub, desert wash, and sagebrush. Nests in an underground burrow. Sandy soil preferred for burrowing, but also commonly burrows on gravel washes and on stony soils. About 3,244,600 acres of potentially suitable habitat occurs in the SEZ region.	162,473 acres of potentially suitable habitat lost (5.0% of available potentially suitable habitat)	330,661 acres of potentially suitable habitat (10.2% of available potentially suitable habitat)	Moderate. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Merriam's kangaroo rat (*Dipodomys merriami*)	Most widespread kangaroo rat in California. In southern California, it occurs in desert scrub and alkali desert scrub, sagebrush, Joshua tree, and pinyon-juniper habitats. Uses desert flats or slopes with sparse to moderate canopy coverage and sandy to gravelly subsrates. Uses underground burrows that are often located at the base of a shrub. About 3,290,800 acres of potentially suitable habitat occurs in the SEZ region.	162,473 acres of potentially suitable habitat lost (4.9% of available potentially suitable habitat)	340,466 acres of potentially suitable habitat (10.3% of available potentially suitable habitat)	Moderate. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.
Southern grasshopper mouse (*Onychomys torridus*)	Hot, arid valleys and scrub deserts with sparse and scattered vegetation such as mesquite, creosotebush, cholla, yucca, and short grasses. Frequents scrub habitats with friable soils for digging. Also uses abandoned underground burrows. About 3,284,300 acres of potentially suitable habitat occurs in the SEZ region.	162,473 acres of potentially suitable habitat lost (4.9% of available potentially suitable habitat)	330,987 acres of potentially suitable habitat (10.1% of available potentially suitable habitat)	Moderate. No species-specific mitigation of direct effects is feasible because suitable habitat is widespread in the area of direct effect.

TABLE 9.4.11.3-1 (Cont.)

Common Name (Scientific Name)	Habitat	Maximum Area of Potential Habitat Affected[a]: Within SEZ (Direct Effects)[b]	Maximum Area of Potential Habitat Affected[a]: Outside SEZ (Indirect Effects)[c]	Overall Impact Magnitude[d] and Species-Specific Mitigation[e]
Nongame (Small) Mammals (Cont.)				
Spotted bat (*Euderma maculatum*)	Mostly found in the foothills, mountains, and desert regions of southern California. Roosts in caves and cracks or crevices in cliffs and canyons. About 3,863,400 acres of potentially suitable habitat occurs in the SEZ region.	140,772 acres of potentially suitable habitat lost (3.6% of available potentially suitable habitat)	425,601 acres of potentially suitable habitat (11.0% of available potentially suitable habitat)	Moderate
Western pipistrelle (*Parastrellus hesperus*)	Deserts and lowlands, desert mountain ranges, desert scrub flats, and rocky canyons. Roosts mostly in rock crevices, sometimes mines and caves, and rarely in buildings. Suitable roosts occur in rocky canyons and cliffs. Most abundant bat in desert regions. About 3,450,700 acres of potentially suitable habitat occurs in the SEZ region.	116,538acres of potentially suitable habitat lost (3.4% of available potentially suitable habitat)	355,587 acres of potentially suitable habitat (10.3% of available potentially suitable habitat)	Moderate

[a] Maximum area of potentially suitable habitat affected relative to total available potentially suitable habitat within the SEZ region (i.e., a 50-mi [80-km] radius from the center of the SEZ). Habitat availability was determined from potentially suitable land cover for each species (USGS 2004, 2005, 2007).

[b] Direct effects within the SEZ consist of ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations. A maximum of 162,473 acres would be developed in the SEZ.

[c] The area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary. Indirect effects include effects from surface runoff, dust, noise, lighting, etc., from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance from the SEZ boundary.

Footnotes continued on next page.

TABLE 9.4.11.3-1 (Cont.)

[d] Overall impact magnitude categories were based on professional judgment and were (1) *small*: ≤1% of potentially suitable habitat for the species would be lost and the activity would not result in a measurable change in the carrying capacity or population size in the affected area; (2) *moderate*: >1 but ≤10% of potentially suitable habitat for the species would be lost and the activity would potentially result in a measurable but moderate (not destabilizing) change in the carrying capacity or population size in the affected area; and (3) *large*: >10% of potentially suitable habitat for the species would be lost and the activity would result in a potentially large, measurable, and destabilizing change in the carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects, because those effects would be difficult to mitigate. Programmatic design features would reduce most indirect effects to negligible levels.

[e] Species-specific mitigation is presented for those species that have particular habitat features that could be readily avoided. For species or individuals occurring outside the SEZ (in the area of indirect effects), no mitigation measures beyond required programmatic design features have been identified.

[f] To convert acres to km^2, multiply by 0.004047.

Sources: CDFG (2008); NatureServe (2010); USGS (2004, 2005, 2007).

Direct impacts on small game, furbearers, and nongame (small) mammal species would be moderate, ranging from 3.3 to 7.2% of potentially suitable habitats lost for the representative species listed in Table 9.4.11.3-1. Larger areas of suitable habitat for mammal species occur within the area of potential indirect effects (e.g., ranging from 9.2% for the American badger and round-tailed ground squirrel to 19.3% for the desert bighorn sheep). Other impacts on mammals could result from collision with fences and vehicles, surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, noise, lighting, spread of invasive species, accidental spills, and harassment. These indirect impacts are expected to be negligible with implementation of programmatic design features.

Decommissioning of facilities and reclamation of disturbed areas after operations cease could result in short-term negative impacts on individuals and habitats adjacent to project areas, but long-term benefits would accrue if suitable habitats were restored in previously disturbed areas. Section 5.10.2.1.4 provides an overview of the impacts of decommissioning and reclamation on wildlife. Of particular importance for mammal species would be the restoration of original ground surface contours, soils, and native plant communities associated with semiarid shrublands.

9.4.11.3.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A, Section A.2.2, would reduce the potential for effects on mammals. While some SEZ-specific design features are best established when project details are considered, design feature that can be identified at this time include the following:

- The fencing around the solar energy development should not block the free passage of mule deer between the Colorado River and mountains or foothills.

- To the extent practicable, ephemeral drainages, Ford Dry Lake and Palen Lake, wetlands, and the CRA should be avoided.

If these SEZ-specific design features are implemented in addition to programmatic design features, impacts on mammal species could be reduced. However, because potentially suitable habitats for a number of the mammal species occur throughout much of the SEZ, additional species-specific mitigation of direct effects for those species would be difficult or infeasible.

9.4.11.4 Aquatic Biota

9.4.11.4.1 Affected Environment

This section addresses aquatic habitats and biota known to occur on the proposed Riverside East SEZ itself or within an area that could be affected, either directly or indirectly, by activities associated with solar energy development within the SEZ. There are no perennial streams within the proposed Riverside East SEZ, but the intermittent McCoy Wash is present. McCoy Wash carries substantial flow, but there is little information on aquatic communities, if present. Palen Lake and Ford Dry Lake are the only water bodies within the SEZ, with approximately 745 acres (3 km^2) of Palen Lake located on the western side of the SEZ, and 3,945 acres (16 km^2) of Ford Dry Lake located in the center of the SEZ. Both Palen Lake and Ford Dry Lake are intermittent and rarely have standing water, but temporary ponding may occur especially in Palen Lake, which has groundwater located near the surface. As described in Section 9.4.9.1.1, there are also 3,807 acres (15 km^2) of wetland within the SEZ. However, wetlands near dry lakes rarely have water (USFS 1998), and the NWI classifies these wetlands as intermittently flooded, indicating that surface water is usually absent but may be present for variable periods. Although site-specific data are s not available, Palen Lake, Ford Dry Lake, and wetlands may contain aquatic biota adapted to desiccating conditions (Graham 2001). On the basis of information from ephemeral pools in the American Southwest, ostracods (seed shrimp) and small planktonic crustaceans (e.g., copepods or cladocerans) are expected to be present, and larger branchiopod crustaceans such as fairy shrimp could occur (Graham 2001). Various types of insects that have aquatic larval stages, such as dragonflies and a variety of midges and other fly larvae, may also occur depending on pool longevity, distance to permanent water features, and the abundance of other invertebrates for prey (Graham 2001). However, more site-specific data are needed to fully evaluate the extent to which aquatic biota are present.

There are no natural perennial stream features within the area of indirect effects. However, 31 mi (50 km) of the CRA is present, primarily along the western edge of the SEZ. The aqueduct diverts water west from the Colorado River at Lake Havasu, located approximately 44 mi (71 km) from the Riverside East SEZ. The aqueduct may support populations of non-native fish common to the lower Colorado River, including striped bass (*Morone saxatilis*), largemouth bass (*Micropterus salmoides*), carp (*Cyprinus carpio*), flathead catfish (*Pylodictis olivaris*), channel catfish (*Ictalurus punctatus*), sunfish (*Lepomis* spp.), and tilapia (*Tilapia* spp.; Mueller and Marsh 2002). Native fish are relatively rare in the lower Colorado River because of overfishing, predation by non-native species, and human alteration of streams and rivers (Mueller and Marsh 2002), and endangered species native to the Colorado River are not expected to occur (see Section 9.4.12). Although aquatic organisms may be present in the CRA, periodic chlorination and draining used to control the population of the invasive quagga mussel (*Dreissena rostriformis bugensis*) (USGS 2008a) makes the aqueduct unsuitable for aquatic organisms. Palen Lake and Ford Dry Lake are the only water bodies present in the area of indirect effects. A total of approximately 3,516 acres (14 km^2) and 460 acres (2 km^2) of Palen Lake and Ford Dry Lake, respectively, are located within the area of potential indirect effects. Approximately 7,757 acres (31 km^2) of wetlands is also located in the area of potential indirect effects. As described above, Ford Dry Lake, Palen Lake, and associated wetlands are typically dry but may support aquatic communities when water is present.

Outside of the potential indirect effects area, but within 50 mi (80 km) of the SEZ, there are several lake and reservoir habitats totaling approximately 62,143 acres (251 km^2). Of this total, 15,998 acres (65 km^2) is permanent lake (Salton Sea), 10,160 acres (41 km^2) is intermittent lake, and 35,984 (146 km^2) is dry lake. Dammed portions of the Colorado River are also present and total 51,004 acres (206 km^2). There are also several stream features including 124 mi (200 km) of the CRA, 74 mi (119 km) of canals, and 168 mi (270 km) of intermittent streams.

Within the SEZ and the area of potential indirect effects, intermittent lakes are the only surface water features present, representing approximately 46% of the amount of intermittent lake available within the overall analysis area.

9.4.11.4.2 Impacts

The types of impacts that could occur on aquatic habitats and biota from development of utility-scale solar energy facilities are discussed in Section 5.10.2.4. Effects particularly relevant to aquatic habitats and communities are water withdrawal and changes in water, sediment, and contaminant inputs associated with runoff.

No permanent water bodies or streams are present within the boundaries of the Riverside East SEZ. Therefore, no direct impacts on these features are expected. The intermittent streams, wetlands, and dry lakes present within the SEZ could be affected by ground disturbance and runoff of water and sediment from the SEZ, especially if ground disturbance occurred near Palen Lake and Ford Dry Lake (see Section 9.4.9). The intermittent streams, dry lakes, and associated wetlands present in the SEZ are typically dry but may support aquatic communities on a seasonal basis. More detailed site surveys of ephemeral and intermittent surface waters would be needed to determine whether solar energy development activities would result in direct or indirect impacts on aquatic biota. See Section 5.10.3 for a detailed description of potential impacts to aquatic biota resulting from solar energy development activities. Avoiding intermittent surface water features within the SEZ as well as the implementation of commonly used engineering practices to control water runoff and sediment deposition into surface water features would minimize the potential for impacts on aquatic organisms.

The man-made CRA is within 5 mi (8 km) of the SEZ and could be indirectly affected by development and operation of solar energy facilities. Aquatic organisms present in these habitat features could be affected by airborne particulate deposition originating from the SEZ, especially if ground disturbance occurred along the SEZ's western boundary (Section 5.10.2.4). Runoff from the SEZ into the CRA would not occur, because the aqueduct is leveed, and natural drainage patterns would carry surface water away from the aqueduct.

As identified in Section 5.9, water quality in aquatic habitats could be affected by the introduction of contaminants such as fuels, lubricants, or pesticides/herbicides during site characterization, construction, operation, or decommissioning for a solar energy facility. There is the potential for contaminants from solar energy development activities within the SEZ to enter McCoy Wash, Palen Lake, Ford Dry Lake, and wetlands within the SEZ, especially if heavy machinery is used in or near these features. The aqueduct runs along the western border of the Riverside East SEZ, but contamination from solar development activities in the SEZ would not occur, because it is leveed and natural drainage patterns would carry runoff away from the CRA.

In arid environments, reductions in the quantity of water in aquatic habitats are of particular concern. Water quantity in aquatic habitats could also be affected if significant amounts of surface water or groundwater were utilized for power plant cooling water, for washing mirrors, or for other needs. The greatest need for water would occur if technologies employing wet cooling, such as parabolic trough or power tower, were developed at the site; the associated impacts would ultimately depend on the water source used (including groundwater from aquifers at various depths). As identified in Section 9.4.9.1.3, it seems unlikely that approval could be obtained to withdraw water from the CRA. Nevertheless, the aqueduct itself is poor habitat and supports no important aquatic species. Obtaining cooling water from other perennial surface water features in the region could affect water levels and, as a consequence, aquatic organisms in those water bodies. Additional details regarding the volume of water required and the types of organisms present in potentially affected water bodies would be required in order to further evaluate the potential for impacts from water withdrawals.

9.4.11.4.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A, Section A.2.2, could greatly reduce or eliminate the potential for effects on aquatic biota and aquatic habitats from development and operation of solar energy facilities. While some SEZ-specific design features are best established when project details are being considered, a design feature that can be identified at this time is as follows:

- Ground disturbance near McCoy Wash, Palen Lake, Ford Dry Lake and wetlands should be avoided or minimized to the extent practicable.

If this design feature is implemented in addition to programmatic project design features and if the utilization of water from groundwater or surface water sources is adequately controlled to maintain sufficient water levels in nearby aquatic habitats, the potential impacts on aquatic biota and habitats from solar energy development at the Riverside East SEZ would be negligible.

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9.4.12 Special Status Species (Threatened, Endangered, Sensitive, and Rare Species)

This section addresses special status species that are known to occur, or for which suitable habitat occurs, on or within the potentially affected area of the proposed Riverside East SEZ. Special status species include the following types of species:[5]

- Species listed as threatened or endangered under the ESA;
- Species that are proposed for listing, under review, or are candidates for listing under the ESA;
- Species that are listed as threatened or endangered by the State of California under the CESA, or that are identified as fully protected by the state[6];
- Species that are listed by the BLM as sensitive; and
- Species that have been ranked by the states of California or Arizona as S1 or S2, or species of concern by the State of California or the USFWS; hereafter referred to as "rare" species. Arizona does not maintain a separate list of species of concern.

Special status species known to occur within 50 mi (80 km) of the Riverside East SEZ center (i.e., the SEZ region) were determined from natural heritage records available through NatureServe Explorer (NatureServe 2010), information provided by the CDFG (2010c), CNDDB (CDFG 2010b), CAReGAP (Davis et al. 1998, USGS 2010d), and SWReGAP (USGS 2004, 2005, 2007). Information reviewed consisted of county-level occurrences as determined from NatureServe, point and polygon element occurrences as determined from CNDDB, and modeled land cover types and predicted suitable habitats for the species within the 50-mi (80-km) region as determined from CAReGAP and SWReGAP. The 50-mi (80-km) SEZ region intersects Imperial, Riverside, and San Bernardino Counties, California, and La Paz and Yuma Counties, Arizona. However, the SEZ and affected area occur only in eastern Riverside County, California. See Appendix M for additional information on the approach used to identify species that could be affected by development within the SEZ.

9.4.12.1 Affected Environment

The affected area considered in this assessment included the areas of direct and indirect effects. The area of direct effects was defined as the area that would be physically modified during project development (i.e., where ground-disturbing activities would occur). For the

[5] See Section 4.6.4 for definitions of these species categories. Note that some of the categories of species included here do not fit BLM's definition of special status species as defined in BLM Manual 6840 (BLM 2008c). These species are included here to ensure broad consideration of species that may be most vulnerable to impacts.

[6] State-listed species are those listed as threatened or endangered under the CESA; California fully protected species are species that receive the strictest take provisions as identified by the CDFG.

Riverside East SEZ, the area of direct effect was limited to the SEZ itself. Because of the proximity of existing infrastructure, the impacts of construction and operation of transmission lines outside the SEZ are not assessed, assuming that the existing transmission infrastructure might be used to connect some new solar facilities to load centers, and that additional project-specific analysis would be conducted for new transmission construction or line upgrades. Similarly, the impacts of construction of or upgrades to access roads were not assessed for this SEZ because of the proximity of State Route 62 (see Section 9.4.1.2 for a discussion of development assumptions for this SEZ). The area of indirect effects was defined as the area within 5 mi (8 km) of the SEZ boundary where ground-disturbing activities would not occur but that could be indirectly affected by activities in the area of direct effect. Indirect effects considered in the assessment included effects from surface runoff, dust, noise, lighting, and accidental spills from the SEZ, but do not include ground-disturbing activities. The potential magnitude of indirect effects would decrease with increasing distance away from the SEZ. This area of indirect effect was identified on the basis of professional judgment and was considered sufficiently large to bound the area that would potentially be subject to indirect effects. The affected area includes both the direct and indirect effects areas.

The primary habitat type within the affected area is Sonora-Mojave creosotebush-white bursage desert scrub (see Section 9.4.10). Potentially unique habitats in the affected area in which special status species may reside include desert dunes, cliffs and rock outcrops, desert washes, playa habitats, and other aquatic habitats such as the CRA. Dry lake playas in the affected area include Ford Dry Lake and Palen Lake. Palen Lake is located in the western portion of the SEZ; Ford Lake is in the center of the SEZ. The CRA is located along the western border of the SEZ (Figure 9.4.12.1-1). There are a number of desert washes on the SEZ that may provide habitat for unique plant assemblages as identified in the Northern and Eastern Colorado (NECO) Management Plan (BLM and CDFG 2002).

All special status species that are known to occur within the Riverside East SEZ region (i.e., within 50 mi [80 km] of the center of the SEZ) are listed, with their status, nearest recorded occurrence, and habitats, in Appendix J. Of these species, there are 69 that could be affected by solar energy development within the SEZ, based on recorded occurrences or the presence of potentially suitable habitat in the area. These species, their status, and their habitats are presented in Table 9.4.12.1-1. For many of the species listed in the table, their predicted potential occurrence in the affected area is based only on a general correspondence between mapped CAReGAP land cover types and descriptions of species habitat preferences. This overall approach to identifying species in the affected area probably overestimates the number of species that actually occur in the affected area. For many of the species identified as having potentially suitable habitat in the affected area, the nearest known occurrence is over 20 mi (32 m) away from the SEZ.

Based on CNDDB records and information provided by the CDFG and USFWS, there are 29 special status species known to occur within the affected area of the Riverside East SEZ: Abrams' spurge, bitter hymenoxys, California ditaxis, California satintail, desert spike-moss, dwarf germander, Emory's crucifixion thorn, glandular ditaxis, Harwood's milkvetch, jackass-clover, Orocopia sage, pink fairy-duster, spear-leaf matelea, Wiggins' cholla, California McCoy snail, Bradley's cuckoo wasp, Riverside cuckoo wasp, desert tortoise, Bendire's thrasher, crissal thrasher, western burrowing owl, Arizona myotis, California leaf-nosed bat, cave myotis, Colorado Valley woodrat, Nelson's bighorn sheep, pallid bat, Townsend's big-eared bat, and western mastiff bat. Of these species, the desert tortoise is listed as threatened under the ESA. Nine of these species are listed as BLM-designated sensitive; the remaining 19 species are considered rare. Designated critical habitat for the desert tortoise occurs within the affected area in the Chuckwalla DWMA adjacent to the southern boundary of the SEZ. There are no groundwater-dependent species in the vicinity of the SEZ based upon CNDDB records, comments provided by the USFWS (Stout 2009), and the evaluation of groundwater resources in the Riverside East SEZ region (Section 9.4.9).

9.4.12.1.1 Species Listed under the Endangered Species Act That Could Occur in the Affected Area

There is one species listed under the ESA that may occur in the affected area of the Riverside East SEZ: the desert tortoise. The Mojave population of the desert tortoise, which includes all populations in California, is listed as a threatened species under the ESA. The desert tortoise is also listed as a threatened species under the CESA. This species is discussed below; additional basic information on life history, habitat needs, and threats to populations of this species is provided in Appendix J. CNDDB records indicate disjunct occurrences of the Coachella Valley milkvetch in the Chuckwalla Valley within the affected area of the SEZ. The Coachella Valley milkvetch is listed as endangered under the ESA. However, the USFWS has confirmed that those occurrences do not belong to the Coachella Valley milkvetch; the nearest known occurrences of this species are from the Coachella Valley, approximately 45 mi (72 km) west of the SEZ. It is unlikely for the Coachella Valley milkvetch to occur in the affected area of the Riverside East SEZ.

In scoping comments on the Riverside East SEZ, the USFWS expressed concern for impacts of solar facilities within the SEZ on the desert tortoise (Stout 2009). This species has the potential to occur within the SEZ based on observed occurrences on and near the SEZ, the presence of designated critical habitat within the area of indirect effects, and the presence of potentially suitable habitat in the SEZ (Figure 9.4.12.1-1; Table 9.4.12.1-1).

The desert tortoise occurs in Joshua Tree NP and the Chuckwalla DWMA, which are adjacent to the western and southern boundary of the proposed Riverside East SEZ. In 2007, surveys for desert tortoises conducted by the USFWS Desert Tortoise Recovery Office indicated a desert tortoise density of about 3.5 and 5.0 individuals/km^2 within Joshua Tree NP and the Chuckwalla DWMA, respectively (Stout 2009). Because the SEZ exists at lower elevations, desert tortoise densities within the SEZ are likely lower than those within the surrounding DWMAs. The SEZ also shares greater connectivity with the Pinto Basin near the Joshua Tree NP. For these reasons, the USFWS used the lower density estimate from the Joshua Tree NP (3.5 individuals/km^2) to estimate that the SEZ may support up to 2,865 desert tortoises.

CNDDB records desert tortoises located within the eastern and western portions of the SEZ (Figure 9.4.12.1-1). According to the CAReGAP habitat suitability model, potentially suitable habitat for the species occurs throughout the majority of the SEZ and the area of indirect

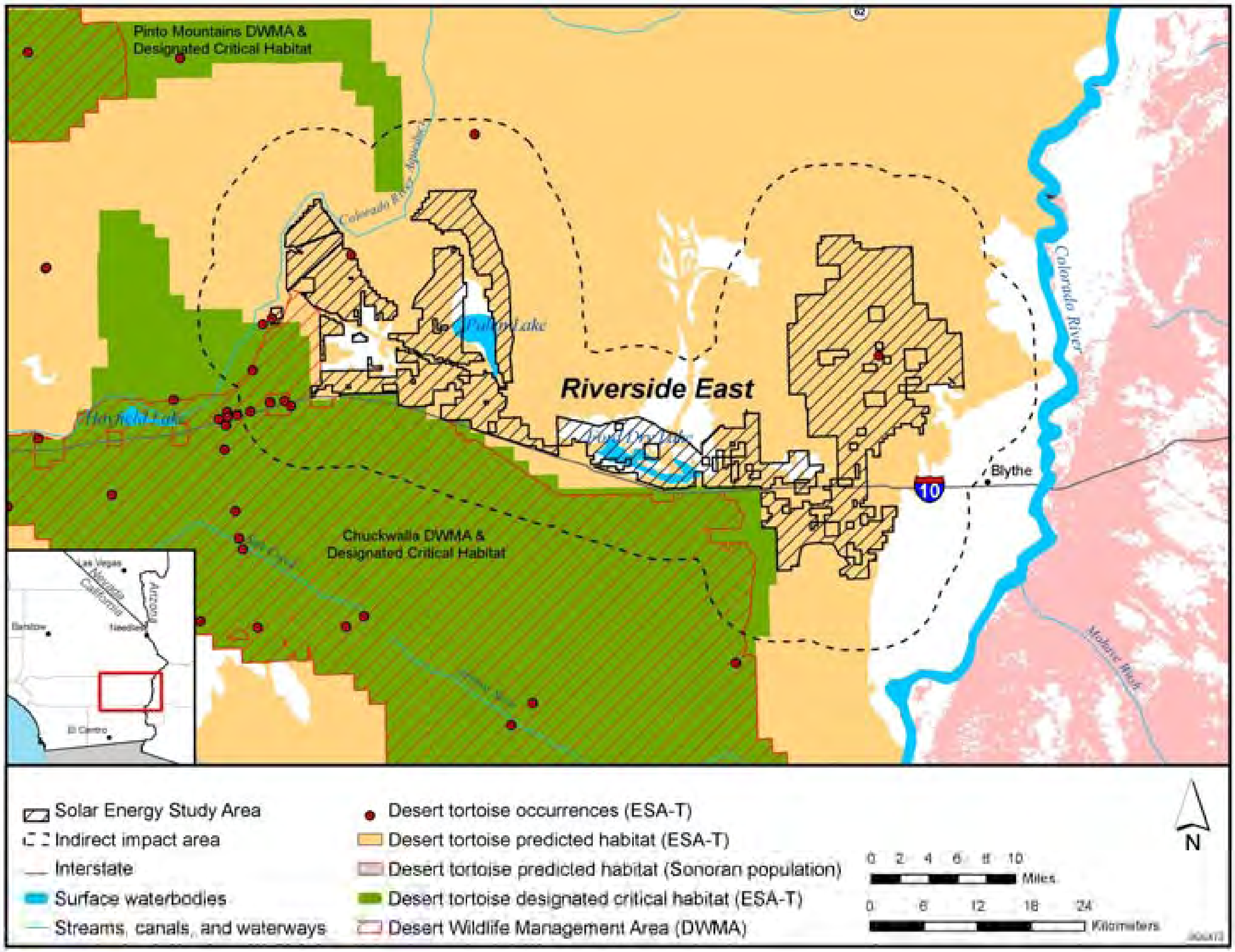

FIGURE 9.4.12.1-1 Known or Potential Occurrences of Species Listed as Endangered or Threatened under the ESA That May Occur in the Proposed Riverside East SEZ Affected Area (Sources: CDFG 2010b; Davis et al. 1998, 2007)

TABLE 9.4.12.1-1 Habitats, Potential Impacts, and Potential Mitigation for Special Status Species That Could Be Affected by Solar Energy Development on the Proposed Riverside East SEZ

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants						
Abrams' spurge	*Chamaesyce abramsiana*	CA-S1	Sandy substrates within creosotebush scrub communities in the Mojave and Sonoran Deserts at elevations below 3,000 ft.[h] Known to occur in the affected area. Nearest recorded occurrence is from the Chuckwalla DWMA, about 1 mi south of the SEZ. About 2,215,155 acres[i] of potentially suitable habitat occurs within the SEZ region.	109,933 acres of potentially suitable habitat lost (5.0% of available suitable habitat)	229,999 acres of potentially suitable habitat (10.4% of available potentially suitable habitat)	Moderate overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance of occupied habitats on the SEZ; translocation of individuals from areas of direct effect; or compensatory mitigation of direct effects on occupied habitats could reduce impacts. Note that these potential mitigations apply to all special status plants.
Alkali mariposa-lily	*Calochortus striatus*	BLM-S; CA-S2; FWS-SC	Alkaline seeps, springs, and meadows at elevations between 2,600 and 4,600 ft. Nearest recorded occurrences are 40 mi west of the SEZ. About 68,658 acres of potentially suitable habitat occurs within the SEZ region.	1,570 acres of potentially suitable habitat lost (2.3% of available suitable habitat)	828 acres of potentially suitable habitat (1.2% of available potentially suitable habitat)	Moderate overall impact. Avoiding or minimizing disturbance to desert playa habitat on the SEZ could reduce impacts. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.

TABLE 9.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Bitter hymenoxys[j]	***Hymenoxys odorata***	CA-S2	Sandy substrates within riparian and Sonoran Desert scrub communities, also within open flats, mesquite flats, ditches and drainage areas, and along roads and streams. Elevation ranges between 150 and 500 ft. Known to occur in the affected area. Nearest recorded occurrences are 5 mi east of the SEZ. About 2,657,966 acres of potentially suitable habitat occurs within the SEZ region.	138,283 acres of potentially suitable habitat lost (5.2% of available suitable habitat)	324,557 acres of potentially suitable habitat (12.2% of available potentially suitable habitat)	Moderate overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
California ditaxis	***Ditaxis serrata* var. *californica***	CA-S2	Sonoran Desert scrub and creosotebush scrub communities at elevations between 100 and 3,300 ft. Known to occur in the affected area. Nearest recorded occurrence is near the CRA, approximately 2 mi west of the SEZ. About 2,514,766 acres of potentially suitable habitat occurs within the SEZ region.	111,496 acres of potentially suitable habitat lost (4.4% of available suitable habitat)	235,102 acres of potentially suitable habitat (9.3% of available potentially suitable habitat)	Moderate overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
California satintail	***Imperata brevifolia***	CA-S2	Chaparral, coastal sage scrub, creosotebush, desert scrub, mesic riparian scrub, and alkaline meadow and seep communities. Elevation ranges between 0 and 1,650 ft. Known to occur in the affected area. Nearest recorded occurrences are 5 mi east of the SEZ. About 2,526,349 acres of potentially suitable habitat occurs within the SEZ region.	111,496 acres of potentially suitable habitat lost (4.4% of available suitable habitat)	235,350 acres of potentially suitable habitat (9.3% of available potentially suitable habitat)	Moderate overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.

TABLE 9.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
California saw-grass	*Cladium californicum*	CA-S2	Alkaline, freshwater, and riparian habitats including meadows, marshes, swamps, and seeps. Elevation ranges between 200 and 2,000 ft. Nearest recorded occurrence is from the vicinity of the Salton Sea, approximately 30 mi southwest of the SEZ. About 117,240 acres of potentially suitable habitat occurs within the SEZ region.	1,793 acres of potentially suitable habitat lost (1.5% of available suitable habitat)	1,162 acres of potentially suitable habitat (1.0% of available potentially suitable habitat)	Moderate overall impact. Avoiding or minimizing disturbance to desert playa and wash habitats on the SEZ could reduce impacts. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
Chaparral sand-verbena	*Abronia villosa* var. *aurita*	BLM-S; CA-S2	Endemic to southern California. Inhabits chaparral desert sand dunes at elevations between 350 and 5,250 ft. Historically occurred on and in the vicinity of the SEZ; the species has not been recorded in the project area since 1964. Most recent recorded occurrences are 23 mi from the SEZ. About 84,357 acres of potentially suitable habitat occurs within the SEZ region.	26,798 acres of potentially suitable habitat lost (31.8% of available suitable habitat)	15,987 acres of potentially suitable habitat (19.0% of available potentially suitable habitat)	Large overall impact. Avoiding or minimizing disturbance to desert dunes and sand transport systems on the SEZ could reduce impacts. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.

TABLE 9.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Coves' cassia	*Senna covesii*	CA-S2	Sonoran Desert dry washes and slopes with sandy substrates within desert scrub and creosotebush scrub communities. Elevation ranges between 1,000 and 3,500 ft. Nearest recorded occurrence is 15 mi from the SEZ. About 3,164,051 acres of potentially suitable habitat occurs within the SEZ region.	136,472 acres of potentially suitable habitat lost (4.3% of available suitable habitat)	314,674 acres of potentially suitable habitat (9.9% of available potentially suitable habitat)	Moderate overall impact. Avoiding or minimizing disturbance to desert wash habitats on the SEZ could reduce impacts. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
Creamy blazing star	*Mentzelia tridentata*	BLM-S; CA-S2	Mojave desert creosotebush scrub communities on rocky and sandy substrates at elevations below 3,900 ft. Nearest recorded occurrences are 45 mi west of the SEZ. About 2,215,155 acres of potentially suitable habitat occurs within the SEZ region.	109,933 acres of potentially suitable habitat lost (5.0% of available suitable habitat)	229,999 acres of potentially suitable habitat (10.4% of available potentially suitable habitat)	Moderate overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
Desert pincushion	*Coryphantha chlorantha*	CA-S1	Gravelly bajadas, limestone, or dolomite rocky slopes associated with desert scrub communities within pinyon-juniper woodlands and Joshua tree woodlands. Elevation ranges between 148 and 7,875 ft. Nearest recorded occurrence is 30 mi from the SEZ. About 2,526,161 acres of potentially suitable habitat occurs within the SEZ region.	111,496 acres of potentially suitable habitat lost (4.4% of available suitable habitat)	235,350 acres of potentially suitable habitat (9.3% of available potentially suitable habitat)	Moderate overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.

TABLE 9.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Desert spike-moss	***Selaginella eremophila***	CA-S2	Gravelly or rocky slopes within creosotebush scrub and Sonoran desert scrub communities. Elevation ranges between 650 and 2,950 ft. Known to occur in the affected area. Nearest recorded occurrence is 5 mi south of the SEZ. About 2,514,766 acres of potentially suitable habitat occurs within the SEZ region.	111,496 acres of potentially suitable habitat lost (4.4% of available suitable habitat)	235,102 acres of potentially suitable habitat (9.3% of available potentially suitable habitat)	Moderate overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
Dwarf germander	***Teucrium cubense* ssp. *depressum***	CA-S2	Desert dunes, playas, riparian, creosotebush scrub, and desert scrub communities. Elevation ranges between 150 and 1,300 ft. Known to occur in the affected area. Nearest recorded occurrence is from the Chuckwalla DWMA, about 1 mi south of the SEZ. About 2,727,570 acres of potentially suitable habitat occurs within the SEZ region.	140,087 acres of potentially suitable habitat lost (5.1% of available suitable habitat)	252,499 acres of potentially suitable habitat (9.3% of available potentially suitable habitat)	Moderate overall impact. Avoiding or minimizing disturbance to playas and desert dunes and sand transport systems could reduce impacts. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
Emory's crucifixion-thorn	***Castela emoryi***	CA-S2	Slightly wet alluvial bottomlands associated with basalt flows within Mojave Desert scrub, non-saline playas, creosotebush scrub, and Sonoran Desert scrub communities. Elevation ranges between 295 and 2,200 ft. Known to occur in the affected area. Nearest recorded occurrence is about 1 mi from the western portion of the SEZ. About 2,594,668 acres of potentially suitable habitat occurs within the SEZ region.	113,066 acres of potentially suitable habitat lost (4.4% of available suitable habitat)	236,178 acres of potentially suitable habitat (9.1% of available potentially suitable habitat)	Moderate overall impact. Avoiding or minimizing disturbance to playas could reduce impacts. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.

TABLE 9.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Giant spanish-needle	*Palafoxia arida* var. *gigantea*	BLM-S; CA-S1	Desert sand dune habitats at elevations below 330 ft. Nearest recorded occurrences are 40 mi south of the SEZ. Suitable habitat may exist on the site. About 84,168 acres of potentially suitable habitat occurs within the SEZ region.	26,798 acres of potentially suitable habitat lost (31.8% of available suitable habitat)	15,987 acres of potentially suitable habitat (19.0% of available potentially suitable habitat)	Large overall impact. Avoiding or minimizing disturbance to desert dunes and sand transport systems on the SEZ could reduce impacts. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
Glandular ditaxis	***Ditaxis claryana***	CA-S1	Sandy substrates within desert scrub communities at elevations below 1,525 ft. Known to occur in the affected area. Nearest recorded occurrence is from the Chuckwalla DWMA, approximately 2 mi south of the SEZ. About 2,526,160 acres of potentially suitable habitat occurs within the SEZ region.	111,496 acres of potentially suitable habitat lost (4.4% of available suitable habitat)	235,350 acres of potentially suitable habitat (9.3% of available potentially suitable habitat)	Moderate overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
Harwood's eriastrum	*Eriastrum harwoodii*	BLM-S; CA-S2	Known from fewer than 20 occurrences in southern California on desert dunes and other sandy habitats at elevations between 650 and 3,000 ft. Nearest recorded occurrence is 15 mi northwest of the SEZ in the Pinto Mountains DWMA. About 84,168 acres of potentially suitable habitat occurs within the SEZ region.	26,798 acres of potentially suitable habitat lost (31.8% of available suitable habitat)	15,987 acres of potentially suitable habitat (19.0% of available potentially suitable habitat)	Large overall impact. Avoiding or minimizing disturbance to dunes and sand transport systems could reduce impacts. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.

TABLE 9.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Harwood's milkvetch	***Astragalus insularis* var. *harwoodii***	CA-S2	Sonoran Desert of Arizona and California on sandy or gravelly substrates of desert dunes within desert scrub communities. Elevation ranges between 0 and 2,325 ft. Known to occur on the SEZ and in other portions of the affected area. About 2,610,178 acres of potentially suitable habitat occurs within the SEZ region.	138,294 acres of potentially suitable habitat lost (5.3% of available suitable habitat)	251,337 acres of potentially suitable habitat (9.6% of available potentially suitable habitat)	Moderate overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
Jackass-clover	***Wislizenia refracta* ssp. *refracta***	CA-S1	Mojave and northern Sonoran Deserts in dunes, sandy washes, roadsides, and playas within creosotebush scrub, alkali sink, or desert scrub communities. Elevation ranges between 2,000 and 2,600 ft. Known to occur in wash habitats in the western portion of the SEZ near Palen Lake. About 813,288 acres of potentially suitable habitat occurs within the SEZ region.	53,991 acres of potentially suitable habitat lost (6.6% of available suitable habitat)	99,483 acres of potentially suitable habitat (12.2% of available potentially suitable habitat)	Moderate overall impact. Avoiding or minimizing disturbance to dunes and sand transport systems, playas, or washes could reduce impacts. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
Latimer's woodland-gilia	*Saltugilia latimeri*	BLM-S; CA-S2	Mojave Desert scrub communities, pinyon-juniper woodlands, and washes on rocky or sandy substrates at elevations between 1,300 and 6,500 ft. Nearest recorded occurrence is 30 mi west of the SEZ. About 2,920,277 acres of potentially suitable habitat occurs within the SEZ region.	136,472 acres of potentially suitable habitat lost (4.7% of available suitable habitat)	314,674 acres of potentially suitable habitat (10.8% of available potentially suitable habitat)	Moderate overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.

TABLE 9.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Little San Bernardino Mountains linanthus	*Linanthus maculatus*	BLM-S; CA-S1	Known from fewer than 20 occurrences in southern California near Joshua Tree National Park in desert dunes and sandy flats with creosotebush scrub and Joshua tree woodland communities at elevations less than 6,900 ft. Nearest recorded occurrences are 30 mi west of the SEZ. About 84,168 acres of potentially suitable habitat occurs within the SEZ region.	26,798 acres of potentially suitable habitat lost (31.8% of available suitable habitat)	15,987 acres of potentially suitable habitat (19.0% of available potentially suitable habitat)	Large overall impact. Avoiding or minimizing disturbance to dunes and sand transport systems on the SEZ could reduce impacts. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
Lobed ground-cherry	*Physalis lobata*	CA-S1	Known from the northeastern Sonoran and southeastern Mojave Deserts in decomposed granitic substrates within creosotebush scrub, alkali sink, desert scrub, and playas communities. Elevation ranges between 1,650 and 2,600 ft. Nearest recorded occurrences are 20 mi northwest of the SEZ. About 2,594,668 acres of potentially suitable habitat occurs within the SEZ region.	113,066 acres of potentially suitable habitat lost (4.4% of available suitable habitat)	236,178 acres of potentially suitable habitat (9.1% of available potentially suitable habitat)	Moderate overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
Munz's cholla	*Opuntia munzii*	BLM-S; CA-S1	Gravelly or sandy to rocky soils, often on lower bajadas, washes, flats, hills and canyon sides in Sonoran Desert creosotebush shrub communities at elevations below 3,280 ft. Nearest recorded occurrences are from the Chuckwalla DWMA, approximately 20 mi south of the SEZ. About 4,187,934 acres of potentially suitable habitat occurs within the SEZ region.	171,716 acres of potentially suitable habitat lost (4.1% of available suitable habitat)	570,180 acres of potentially suitable habitat (13.6% of available potentially suitable habitat)	Moderate overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.

TABLE 9.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Narrow-leaved psorothamnus	*Psorothamnus fremontii* var. *attenuatus*	CA-S2	Volcanic substrates of slopes, flats, and canyons within Sonoran Desert scrub communities at elevations between 1,100 and 3,000 ft. Nearest recorded occurrences are from the vicinity of the Whipple Mountains, approximately 32 mi northeast of the SEZ. About 2,863,434 acres of potentially suitable habitat occurs within the SEZ region.	141,075 acres of potentially suitable habitat lost (4.9% of available suitable habitat)	370,466 acres of potentially suitable habitat (12.9% of available potentially suitable habitat)	Moderate overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
Orocopia sage	***Salvia greatae***	BLM-S; CA-S2	Creosotebush scrub communities and dry washes at elevations less than 2,600 ft. Known to occur in the affected area. Nearest occurrences are from the Chuckwalla DWMA about 2 mi south of the SEZ. About 2,853,196 acres of potentially suitable habitat occurs within the SEZ region.	134,909 acres of potentially suitable habitat lost (4.7% of available suitable habitat)	309,323 acres of potentially suitable habitat (10.8% of available potentially suitable habitat)	Moderate overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
Parish's club-cholla	*Grusonia parishii*	CA-S2	Silty, sandy, or gravelly flats, dunelets, and hills within Joshua tree woodlands, creosotebush scrub, and desert scrub communities. Elevation ranges between 100 and 5,000 ft. Nearest recorded occurrences are 10 mi west of the SEZ. About 2,995,669 acres of potentially suitable habitat occurs within the SEZ region.	169,461 acres of potentially suitable habitat lost (5.7% of available suitable habitat)	396,498 acres of potentially suitable habitat (13.2% of available potentially suitable habitat)	Moderate overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
Pink fairy-duster	***Calliandra eriophylla***	CA-S2	Sandy or rocky substrates in creosote and desert scrub communities. Elevation ranges between 390 and 4,900 ft. Known to occur in the affected area. The species is known to occur in habitats along I-10 about 0.5 mi south of the SEZ. About 2,526,160 acres of potentially suitable habitat occurs within the SEZ region.	111,496 acres of potentially suitable habitat lost (4.4% of available suitable habitat)	235,350 acres of potentially suitable habitat (9.3% of available potentially suitable habitat)	Moderate overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.

TABLE 9.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Purple-nerve cymopterus	*Cymopterus multinervatus*	CA-S2	Sandy or gravelly slopes within desert scrub, Joshua tree woodland, and pinyon-juniper woodland communities. Elevation ranges between 2,600 and 5,900 ft. Nearest recorded occurrences are from San Bernardino County, California, approximately 40 mi northwest of the SEZ. About 2,526,160 acres of potentially suitable habitat occurs within the SEZ region.	111,496 acres of potentially suitable habitat lost (4.4% of available suitable habitat)	235,350 acres of potentially suitable habitat (9.3% of available potentially suitable habitat)	Moderate overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
Saguaro cactus	*Carnegiea gigantea*	CA-S1	Endemic to the Sonoran Desert along the Colorado River from the Whipple Mountains to Laguna Dam. Rocky substrates within Sonoran desert scrub and creosotescrub communities at elevations between 160 and 4,900 ft. Nearest recorded occurrence is from the Palo Verde Mountains WA, approximately 10 mi south of the SEZ. About 2,863,434 acres of potentially suitable habitat occurs within the SEZ region.	141,075 acres of potentially suitable habitat lost (4.9% of available suitable habitat)	370,466 acres of potentially suitable habitat (12.9% of available potentially suitable habitat)	Moderate overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
Salt Spring checkerbloom	*Sidalcea neomexicana*	CA-S2	Alkaline or mesic substrates within riparian wetlands, marshes, springs, chaparral, coastal scrub, coniferous forest, desert scrub, and playas habitats. Elevation ranges between 50 and 5,000 ft. Nearest recorded occurrences are approximately 40 mi northwest of the SEZ. About 2,643,589 acres of potentially suitable habitat occurs within the SEZ region.	113,289 acres of potentially suitable habitat lost (4.3% of available suitable habitat)	236,512 acres of potentially suitable habitat (8.9% of available potentially suitable habitat)	Moderate overall impact. Avoiding or minimizing disturbance to desert playa and wash habitats on the SEZ could reduce impacts. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.

TABLE 9.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Sand evening-primrose	*Camissonia arenaria*	CA-S2	Sandy washes and rocky slopes within Sonoran desert scrub communities at elevations below 3,000 ft. Nearest recorded occurrence is 13 mi south of the SEZ in the Chuckwalla DWMA. About 3,501,475 acres of potentially suitable habitat occurs within the SEZ region.	166,051 acres of potentially suitable habitat lost (4.7% of available suitable habitat)	449,790 acres of potentially suitable habitat (12.8% of available potentially suitable habitat)	Moderate overall impact. Avoiding or minimizing disturbance to desert wash habitats on the SEZ could reduce impacts. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
Slender cottonheads	*Nemacaulis denudata* var. *gracilis*	CA-S2	Southern California within the Mojave and Sonoran Deserts on sandy soils within coastal dunes, desert dunes, creosotebush scrub, and desert scrub communities at elevations below 1,300 ft. Nearest recorded occurrences are 40 mi west of the SEZ. About 1,786,349 acres of potentially suitable habitat occurs within the SEZ region.	138,294 acres of potentially suitable habitat lost (7.7% of available suitable habitat)	251,337 acres of potentially suitable habitat (14.1% of available potentially suitable habitat)	Moderate overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
Small-flowered androstephium	*Androstephium breviflorum*	CA-S1	Dry sandy to rocky soil substrates in desert dunes within creosotebush scrub and Mojavean desert scrub at elevations between 720 and 2,100 ft. Nearest occurrences are approximately 10 mi north of the SEZ. About 2,715,222 acres of potentially suitable habitat occurs within the SEZ region.	167,873 acres of potentially suitable habitat lost (6.2% of available suitable habitat)	386,701 acres of potentially suitable habitat (14.2% of available potentially suitable habitat)	Moderate overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.

TABLE 9.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Spear-leaf matelea	***Matelea parvifolia***	CA-S2	Endemic to southeastern California on rocky substrates within creosotebush and desert scrub communities at elevations between 1,450 and 3,600 ft. Known to occur in the affected area. Nearest recorded occurrences are 5 mi south of the SEZ in the Chuckwalla DWMA. About 2,526,160 acres of potentially suitable habitat occurs within the SEZ region.	111,496 acres of potentially suitable habitat lost (4.4% of available suitable habitat)	235,350 acres of potentially suitable habitat (9.3% of available potentially suitable habitat)	Moderate overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
Thorny milkwort	*Polygala acanthoclada*	CA-S2	Loose, sandy or gravelly slopes within shadscale scrub, chenopod scrub, Joshua tree woodland, and pinyon-juniper woodland communities at elevations between 2,500 and 7,500 ft. Nearest recorded occurrences are 25 mi west of the SEZ. About 2,526,161 acres of potentially suitable habitat occurs within the SEZ region.	111,496 acres of potentially suitable habitat lost (4.4% of available suitable habitat)	235,350 acres of potentially suitable habitat (9.3% of available potentially suitable habitat)	Moderate overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
Three-awned grama	*Bouteloua trifida*	CA-S2	Eastern Mojave Desert mountains on dry, rocky, often calcareous slopes within desert scrub communities. Elevation ranges between 2,300 and 6,500 ft. Nearest recorded occurrence is 40 mi north of the SEZ. About 2,282,236 acres of potentially suitable habitat occurs within the SEZ region.	111,496 acres of potentially suitable habitat lost (4.9% of available suitable habitat)	235,350 acres of potentially suitable habitat (10.3% of available potentially suitable habitat)	Moderate overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
White-margined beardtongue	*Penstemon albomarginatus*	BLM-S; CA-S1; FWS-SC	Desert sand dune habitats and Mojave Desert scrub communities at elevations below 3,600 ft. Nearest recorded occurrences are 50 mi north of the SEZ. About 2,366,404 acres of potentially suitable habitat occurs within the SEZ region.	138,294 acres of potentially suitable habitat lost (5.8% of available suitable habitat)	251,337 acres of potentially suitable habitat (10.6% of available potentially suitable habitat)	Moderate overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.

TABLE 9.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Plants (Cont.)						
Wiggins' cholla	***Opuntia wigginsii***	CA-S1	Sandy substrates of small washes and flats within creosotebush scrub and Sonoran Desert scrub communities. Elevation ranges between 100 and 2,900 ft. Known to occur in the affected area. Nearest recorded occurrences are approximately 5 mi south of the SEZ. About 2,909,226 acres of potentially suitable habitat occurs within the SEZ region.	136,472 acres of potentially suitable habitat lost (4.7% of available suitable habitat)	314,426 acres of potentially suitable habitat (10.8% of available potentially suitable habitat)	Moderate overall impact. See Abrams' spurge for a list of potential mitigations applicable to all special status plant species.
Mollusks						
California McCoy snail	***Eremarionta rowelli mccoiana***	CA-S1	Known only from Riverside County, California within an area less than 40 mi^2 near the southern Palen/McCoy Wilderness. Lives terrestrially among rocks on talus slopes. Known to occur in the affected area. Nearest occurrences are from the Palen/McCoy Mountains within 1 mi north of the SEZ. About 949,247 acres of potentially suitable habitat occurs within the SEZ region.	5,640 acres of potentially suitable habitat lost (0.6% of available suitable habitat)	115,696 acres of potentially suitable habitat (12.2% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats on the SEZ or compensatory mitigation of direct effects on occupied habitats could reduce impacts.

TABLE 9.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Arthropods						
Bradley's cuckoo wasp	*Ceratochrysis bradleyi*	CA-S1	Endemic to California where it is known only from eastern Riverside County in Sonoran Desert scrub, creosote-scrub, yucca and cholla cactus, saltbush, and desert dune communities. Known to occur in the affected area. Nearest recorded occurrence is 2 mi east of the SEZ. About 2,610,178 acres of potentially suitable habitat occurs within the SEZ region.	138,294 acres of potentially suitable habitat lost (5.3% of available suitable habitat)	251,337 acres of potentially suitable habitat (9.6% of available potentially suitable habitat)	Moderate overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats on the SEZ or compensatory mitigation of direct effects on occupied habitats could reduce impacts.
Cheeseweed owlfly	*Oliarces clara*	CA-S1; FWS-SC	Colorado River drainage of southwestern Arizona and southern California within creosote-scrub communities on or near bajadas at elevations below 330 ft. Nearest recorded occurrence is 10 mi north of the SEZ. About 2,215,155 acres of potentially suitable habitat occurs within the SEZ region.	109,933 acres of potentially suitable habitat lost (5.0% of available suitable habitat)	229,999 acres of potentially suitable habitat (10.4% of available potentially suitable habitat)	Moderate overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats on the SEZ or compensatory mitigation of direct effects on occupied habitats could reduce impacts.

TABLE 9.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Arthropods (Cont.)						
Riverside cuckoo wasp	***Hedychridium argenteum***	CA-S1	Endemic to California where it is known only from eastern Riverside County in Sonoran Desert scrub, creosotebush scrub, yucca and cholla cactus, saltbush, and desert dune communities. The only known CNDDB occurrence for this species is within the SEZ near the southern border of the SEZ. About 2,610,178 acres of potentially suitable habitat occurs within the SEZ region.	138,294 acres of potentially suitable habitat lost (5.3% of available suitable habitat)	251,337 acres of potentially suitable habitat (9.6% of available potentially suitable habitat)	Moderate overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats on the SEZ or compensatory mitigation of direct effects on occupied habitats could reduce impacts.
Roberts' rhopalolemma bee	*Rhopalolemma robertsi*	CA-S1	Endemic to southern California from desert wash habitats in southern San Bernardino County. Nearest recorded occurrences are 35 mi west of the SEZ. About 637,257 acres of potentially suitable habitat occurs within the SEZ region.	24,976 acres of potentially suitable habitat lost (3.9% of available suitable habitat)	79,324 acres of potentially suitable habitat (12.4% of available potentially suitable habitat)	Moderate overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats on the SEZ or compensatory mitigation of direct effects on occupied habitats could reduce impacts.

TABLE 9.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Amphibians						
Couch's spadefoot	*Scaphiopus couchii*	CA-S2; CA-SC	Scattered populations east of the Algodones Mountains north along the Colorado River in wetland habitats that include temporary pools, ponds, and puddles. Often occurs in arid and semiarid shrublands, shortgrass plains, mesquite savanna, creosotebush, thorn forest, and cultivated areas. Elevation ranges between 690 and 1,120 ft. Nearest recorded occurrences are 6 mi southeast of the SEZ. About 424,690 acres of potentially suitable habitat occurs within the SEZ region.	20,880 acres of potentially suitable habitat lost (4.9% of available suitable habitat)	62,922 acres of potentially suitable habitat (14.8% of available potentially suitable habitat)	Moderate overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats on the SEZ or compensatory mitigation of direct effects on occupied habitats could reduce impacts.
Reptiles						
Desert tortoise	***Gopherus agassizii***	ESA-T; CA-T; CA-S2;	Mojave and Sonoran Deserts in desert creosote bush communities on firm soils for digging burrows, along riverbanks, washes, canyon bottoms, creosote flats, and desert oases. Known to occur on the SEZ (western and northeastern portions) and in the affected area. About 4,205,025 acres of potentially suitable habitat occurs within the SEZ region.	185,274 acres of potentially suitable habitat lost (4.4% of available suitable habitat)	542,622 acres of potentially suitable habitat (12.9% of available potentially suitable habitat)	Moderate overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats on the SEZ, translocation of individuals from areas of direct effect, or compensatory mitigation of direct effects on occupied habitats could reduce impacts. The potential for impact and need for mitigation should be determined in consultation with the USFWS and CDFG.

TABLE 9.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Reptiles (Cont.)						
Mojave fringe-toed lizard	*Uma scoparia*	BLM-S; CA-SC	Sandy habitats in the Mojave Desert from Death Valley south to the Colorado River near Blythe, California and extreme western Arizona. Sparsely-vegetated desert areas with fine wind-blown sand, including dunes, flats, and washes at elevations below 3,000 ft. Nearest recorded occurrences are 25 mi north of the SEZ. About 1,840,628 acres of potentially suitable habitat occurs within the SEZ region.	140,506 acres of potentially suitable habitat lost (7.6% of available suitable habitat)	380,038 acres of potentially suitable habitat (20.6% of available potentially suitable habitat)	Moderate overall impact. Avoiding or minimizing disturbance of desert dunes and sand transport systems or washes could reduce impacts. In addition, pre-disturbance surveys and avoiding or minimizing disturbance of occupied habitats on the SEZ or compensatory mitigation of direct effects could reduce impacts.
Rosy boa	*Charina trivirgata*	BLM-S; FWS-SC	Southeastern California and western Arizona in scrublands, rocky deserts, and canyons with permanent or intermittent streams. Nearest recorded occurrences are from Joshua Tree NP, approximately 25 mi west of the SEZ. About 4,171,153 acres of potentially suitable habitat occurs within the SEZ region.	185,274 acres of potentially suitable habitat lost (4.4% of available suitable habitat)	544,126 acres of potentially suitable habitat (13.0% of available potentially suitable habitat)	Moderate overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats on the SEZ, translocation of individuals from areas of direct effect, or compensatory mitigation of direct effects on occupied habitats could reduce impacts.

TABLE 9.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Birds						
Bendire's thrasher	***Toxostoma bendirei***	BLM-S; CA-SC	Summer resident in the SEZ region in a variety of desert habitats with fairly large shrubs or cacti and open ground, or open woodland with scattered shrubs and trees, between 0 and 550 m elevation. Nearest recorded occurrence is 2 mi south of the SEZ in the Chuckwalla DWMA. About 2,526,161 acres of potentially suitable habitat occurs within the SEZ region.	111,496 acres of potentially suitable habitat lost (4.4% of available suitable habitat)	235,350 acres of potentially suitable habitat (9.3% of available potentially suitable habitat)	Moderate overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats, especially nesting habitats on the SEZ, or compensatory mitigation of direct effects on occupied habitats could reduce impacts.
Crissal thrasher	***Toxostoma crissale***	CA-SC; FWS-SC	Year-round resident in SEZ region in dense thickets of scrubs or low trees in desert riparian and desert wash habitats, and in washes within pinyon-juniper habitats. Nearest recorded occurrence is approximately 1 mi south of the SEZ. About 295,943 acres of potentially suitable habitat occurs within the SEZ region.	635 acres of potentially suitable habitat lost (0.2% of available suitable habitat)	13,309 acres of potentially suitable habitat (4.5% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats, especially nesting habitats on the SEZ, or compensatory mitigation of direct effects on occupied habitats could reduce impacts.

TABLE 9.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Birds (Cont.)						
Ferruginous hawk	*Buteo regalis*	BLM-S; FWS-SC	Winter resident and migrant in the SEZ region at lower elevations in open grasslands, shrublands, sagebrush flats, desert scrub, desert valleys, and fringes of pinyon-juniper habitats. Occurs in Riverside County, California in the SEZ region. About 1,978,858 acres of potentially suitable habitat occurs within the SEZ region.	112,197 acres of potentially suitable foraging habitat lost (5.7% of available suitable habitat)	287,942 acres of potentially suitable habitat (14.6% of available potentially suitable habitat)	Moderate overall impact on foraging habitat only. Avoidance of direct impacts on all foraging habitat is not feasible because suitable foraging habitat is widespread in the area of direct effects.
Gila woodpecker	*Melanerpes uropygialis*	CA-E; CA-S1	Year-round resident in the SEZ region along the Colorado River in desert riparian and desert wash habitats, orchards, vineyards, and urban habitats. Nearest recorded occurrence is from the Colorado River, approximately 6 mi east of the SEZ. About 297,582 acres of potentially suitable habitat occurs within the SEZ region.	0 acres	300 acres of potentially suitable habitat (0.1% of available potentially suitable habitat)	Small overall impact; no direct impact. No species-specific mitigation is needed.
Hepatic tanager	*Piranga flava*	CA-S1	Summer resident in SEZ region in open coniferous forests, montane pine-oak forests, riparian woodlands, and pine savanna. Nests high in coniferous or deciduous trees. Nearest recorded occurrences are 17 mi from the SEZ. About 3,283 acres of potentially suitable habitat occurs within the SEZ region.	223 acres of potentially suitable habitat lost (6.8% of available suitable habitat)	8 acres of potentially suitable habitat (0.2% of available potentially suitable habitat)	Moderate overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats, especially nesting habitats on the SEZ, or compensatory mitigation of direct effects on occupied habitats could reduce impacts.

TABLE 9.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Birds (Cont.)						
Loggerhead shrike	*Lanius ludovicianus*	CA-SC; FWS-SC	Breeds in SEZ region in open woodlands with moderate grass cover interspersed with areas of bare ground. Nearest recorded occurrences are approximately 10 mi south of the SEZ. About 3,635,415 acres of potentially suitable habitat occurs within the SEZ region.	202,050 acres of potentially suitable habitat lost (5.6% of available suitable habitat)	574,386 acres of potentially suitable habitat (15.8% of available potentially suitable habitat)	Moderate overall impact. Avoiding or minimizing disturbance of all woodland habitat on the SEZ would reduce or eliminate impacts. Alternatively, pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats, especially nesting habitats on the SEZ, or compensatory mitigation of direct effects on occupied habitats could reduce impacts.

TABLE 9.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Birds (Cont.)						
Lucy's warbler	*Vermivora luciae*	CA-S2; CA-SC	Riparian, chaparral, and hardwood woodlands having standing snags or hollow trees. Nonbreeding habitat includes dry washes and riparian forests. Nearest recorded occurrences are from the Colorado River, approximately 20 mi southeast of the SEZ. About 376,331 acres of potentially suitable habitat occurs within the SEZ region.	636 acres of potentially suitable habitat lost (0.2% of available suitable habitat)	15,966 acres of potentially suitable habitat (4.2% of available potentially suitable habitat)	Small overall impact. Avoiding or minimizing disturbance of all woodland and riparian habitat on the SEZ would reduce or eliminate impacts. Alternatively, pre-disturbance surveys and avoiding or minimizing disturbance to occupied habitats, especially nesting habitats on the SEZ, or compensatory mitigation of direct effects on occupied habitats could reduce impacts.
Western burrowing owl	*Athene cunicularia hypugaea*	BLM-S; CA-S2; CA-SC; FWS-SC	Year-round resident in the SEZ region. Open areas with short, sparse vegetation, including grasslands, agricultural fields, and disturbed areas. Nests in burrows created by mammals or tortoises. Known to occur in the affected area. Nearest occurrences are within 1 mi east of the SEZ. About 4,653,092 acres of potentially suitable habitat occurs within the SEZ region.	202,844 acres of potentially suitable habitat lost (4.4% of available suitable habitat)	652,982 acres of potentially suitable habitat (14.0% of available potentially suitable habitat)	Moderate overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance of occupied burrows and habitats in the area of direct effects or compensatory mitigation of direct effects on occupied habitats could reduce impacts.

TABLE 9.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Birds (Cont.)						
Arizona myotis	*Myotis occultus*	CA-S2; CA-SC; FWS-SC	Ponderosa pine and oak-pine woodlands in close proximity to water, and riparian forests within along the Colorado River. Known to occur in the affected area. Nearest recorded occurrences are 4 mi east of the SEZ. About 802,324 acres of potentially suitable habitat occurs within the SEZ region.	25,199 acres of potentially suitable habitat lost (3.1% of available suitable habitat)	79,658 acres of potentially suitable habitat (9.9% of available potentially suitable habitat)	Moderate overall impact on mostly foraging habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of discovered roost areas on the SEZ could reduce impacts.
California leaf-nosed bat	*Macrotus californicus*	BLM-S; CA-S2; CA-SC; FWS-SC	Year-round resident in SEZ region in desert riparian, desert wash, desert scrub, and palm oasis habitats at elevations below 2,000 ft. Roosts in mines, caves, and buildings. Known to occur in the affected area. Nearest recorded occurrences are from the Palen/McCoy Wilderness within 2 mi of the SEZ. About 3,973,317 acres of potentially suitable habitat occurs within the SEZ region.	142,335 acres of potentially suitable habitat lost (3.6% of available suitable habitat)	430,378 acres of potentially suitable habitat (10.8% of available potentially suitable habitat)	Moderate overall impact on mostly foraging habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of discovered roost areas on the SEZ could reduce impacts.
Cave myotis	*Myotis velifer*	BLM-S; CA-S1; CA-SC; FWS-SC	Year-round resident in SEZ region in desert scrub, shrublands, washes, and riparian habitats. Roosts in colonies in caves. Known to occur in the affected area. Nearest recorded occurrence is from the Mule Mountains ACEC about 2 mi south of the SEZ. About 4,136,719 acres of potentially suitable habitat occurs within the SEZ region.	142,335 acres of potentially suitable habitat lost (3.4% of available suitable habitat)	430,704 acres of potentially suitable habitat (10.4% of available potentially suitable habitat)	Moderate overall impact on mostly foraging habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of discovered roost areas on the SEZ could reduce impacts.

TABLE 9.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Birds (Cont.)						
Colorado Valley woodrat	*Neotoma albigula venusta*	CA-S1	Low-lying desert, creosote-mesquite, and pinyon-juniper habitats. Distribution is strongly influenced by the availability of den-building materials, including litter of cholla, prickly pear, mesquite, and catclaw, as well as its low tolerance for cold temperatures. Known to occur in the affected area. Nearest recorded occurrences are on BLM lands about 1 mi southeast of the SEZ. About 3,066,791 acres of potentially suitable habitat occurs within the SEZ region.	167,910 acres of potentially suitable habitat lost (5.5% of available suitable habitat)	425,558 acres of potentially suitable habitat (13.9% of available potentially suitable habitat)	Moderate overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance of occupied habitats on the SEZ or compensatory mitigation of direct effects on occupied habitats could reduce impacts.
Nelson's bighorn sheep	*Ovis canadensis nelsoni*	BLM-S; FWS-SC	Open, steep rocky terrain in mountainous habitats of the eastern Mojave and Sonoran Deserts in California. Rarely uses desert lowlands, except as corridors for travel between mountain ranges. Known to occur in the affected area. Nearest recorded occurrences are from the Joshua Tree Wilderness and the Chuckwalla DWMA, about 2 mi north, west, and south of the SEZ. About 1,896,141 acres of potentially suitable habitat occurs within the SEZ region.	42,020 acres of potentially suitable habitat lost (2.2% of available suitable habitat)	223,604 acres of potentially suitable habitat (11.8% of available potentially suitable habitat)	Moderate overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance of occupied habitats within the SEZ other habitats that serve as movement corridors could further reduce impacts.
Pallid bat	*Antrozous pallidus*	BLM-S; CA-SC; FWS-SC	Year-round resident in SEZ region in low-elevation desert communities, including grasslands, shrublands, and woodlands. Roosts in caves, crevices, and mines. Known to occur in the affected area. Nearest recorded occurrence is from the Chuckwalla Mountains Wilderness approximately 5 mi south of the SEZ. About 3,668,119 acres of potentially suitable habitat occurs within the SEZ region.	117,359 acres of potentially suitable habitat lost (3.2% of available suitable habitat)	351,380 acres of potentially suitable habitat (9.6% of available potentially suitable habitat)	Moderate overall impact on mostly foraging habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of discovered roost areas on the SEZ could reduce impacts.

TABLE 9.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Birds (Cont.)						
Palm Springs pocket mouse	*Perognathus longimembris bangsi*	BLM-S; CA-S2; CA-SC	Creosote scrub, desert scrub, and grasslands on loose or sandy soils. Nearest recorded occurrence is from the Chuckwalla DWMA, approximately 25 mi west of the SEZ. About 3,749,649 acres of potentially suitable habitat occurs within the SEZ region.	198,472 acres of potentially suitable habitat lost (5.3% of available suitable habitat)	512,782 acres of potentially suitable habitat (13.7% of available potentially suitable habitat)	Moderate overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance of occupied habitats on the SEZ or compensatory mitigation of direct effects on occupied habitats could reduce impacts.
Pocketed free-tailed bat	*Nyctinomops femorosaccus*	CA-S2; CA-SC; FWS-SC	Year-round resident in SEZ region lowland areas including creosotebush and chaparral habitats in association with very large boulders, high cliffs, rugged rock outcroppings, and rocky canyons. Nearest recorded occurrences are 37 mi south of the SEZ. About 1,964,239 acres of potentially suitable habitat occurs within the SEZ region.	111,496 acres of potentially suitable habitat lost (5.7% of available suitable habitat)	235,350 acres of potentially suitable habitat (12.0% of available potentially suitable habitat)	Moderate overall impact on mostly foraging habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of discovered roost areas on the SEZ could reduce impacts.
Spotted bat	*Euderma maculatum*	BLM-S; CA-S2	Year-round resident in SEZ region in deserts, grasslands, and mixed coniferous forests at elevations below 10,000 ft. Roosts in caves, rock crevices, and buildings. Nearest recorded occurrence is 40 mi west of the SEZ. Suitable habitat exists on the site. About 2,363,936 acres of potentially suitable habitat occurs within the SEZ region.	111,719 acres of potentially suitable habitat lost (4.7% of available suitable habitat)	235,684 acres of potentially suitable habitat (10.0% of available potentially suitable habitat)	Moderate overall impact on mostly foraging habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of discovered roost areas on the SEZ could reduce impacts.

TABLE 9.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Birds (Cont.)						
Townsend's big-eared bat	*Corynorhinus townsendii*	BLM-S; CA-S2; CA-SC; FWS-SC	Year-round resident in SEZ region in all habitats but subalpine and alpine habitats, and at any season. Roosts in caves, mines, tunnels, buildings, or other human-made structures. Known to occur in the affected area. Nearest recorded occurrences are approximately 4 mi southeast of the SEZ. About 5,065,765 acres of potentially suitable habitat occurs within the SEZ region.	202,912 acres of potentially suitable habitat lost (4.0% of available suitable habitat)	655,256 acres of potentially suitable habitat (12.9% of available potentially suitable habitat)	Moderate overall impact on mostly foraging habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of discovered roost areas on the SEZ could reduce impacts.
Western mastiff bat	*Eumops perotis californicus*	BLM-S; CA-SC; FWS-SC	Year-round resident in SEZ region in open semiarid habitats, including conifer and deciduous woodlands, shrublands, grasslands, chaparral, and urban areas. Roosts in crevices in cliff faces, buildings, and tall trees. Known to occur in the affected area. Nearest recorded occurrence is 5 mi south of the SEZ. About 4,069,881 acres of potentially suitable habitat occurs within the SEZ region.	202,912 acres of potentially suitable habitat lost (5.0% of available suitable habitat)	655,256 acres of potentially suitable habitat (16.1% of available potentially suitable habitat)	Moderate overall impact on mostly foraging habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of discovered roost areas on the SEZ could reduce impacts.
Western small-footed myotis	*Myotis ciliolabrum*	BLM-S; CA-S2	Year-round resident in SEZ region in woodland and riparian habitats at elevations below 9,000 ft. Roosts in caves, buildings, mines, and crevices of cliff faces. Nearest recorded occurrence is from the Chocolate Mountains, approximately 30 mi south of the SEZ. About 661,873 acres of potentially suitable habitat occurs within the SEZ region.	25,199 acres of potentially suitable habitat lost (3.8% of available suitable habitat)	79,658 acres of potentially suitable habitat (12.0% of available potentially suitable habitat)	Moderate overall impact on mostly foraging habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of discovered roost areas on the SEZ could reduce impacts.

TABLE 9.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Birds (Cont.)						
Western yellow bat	*Lasiurus xanthinus*	BLM-S; AZ-WSC; AZ-S2; CA-SC	Year-round resident in SEZ region in desert riparian, desert wash, and palm oasis habitats at elevations below 2,000 ft. Roosts in trees. Nearest recorded occurrence is from Blythe, California, approximately 6 mi east of the SEZ. About 1,340,978 acres of potentially suitable habitat occurs within the SEZ region.	25,199 acres of potentially suitable habitat lost (1.9% of available suitable habitat)	79,658 acres of potentially suitable habitat (5.9% of available potentially suitable habitat)	Moderate overall impact on mostly foraging habitat. Pre-disturbance surveys and avoiding or minimizing disturbance of discovered roost areas on the SEZ could reduce impacts.
Yuma hispid cotton rat	*Sigmodon hispidus eremicus*	AZ-S2; CA-S2; CA-SC; FWS-SC	Dense stands of vegetation near wetlands, herbaceous grasslands, and hardwood woodland communities especially dense grassy areas such as fields, marshes, and roadside edges, brushy areas along streams or ponds, irrigated fields, and desert scrub. Nearest recorded occurrences are 50 mi south of the SEZ. About 176,434 acres of potentially suitable habitat occurs within the SEZ region.	76 acres of potentially suitable habitat lost (<0.1% of available suitable habitat)	53,096 acres of potentially suitable habitat (30.1% of available potentially suitable habitat)	Small overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance of occupied habitats on the SEZ, or compensatory mitigation of direct effects on occupied habitats could reduce impacts.

TABLE 9.4.12.1-1 (Cont.)

Common Name	Scientific Name	Listing Status[a]	Habitat[b]	Maximum Area of Potential Habitat Affected[c]: Within SEZ (Direct Effects)[d]	Maximum Area of Potential Habitat Affected[c]: Outside SEZ (Indirect Effects)[e]	Overall Potential Impact Magnitude[f] and Species-Specific Mitigation[g]
Birds (Cont.)						
Yuma mountain lion	*Puma concolor browni*	CA-S1; CA-SC	Riparian bottomlands, cottonwood-willow forests, mesquite bosques, adjacent desert foothills, low rocky mountains, and canyons within desert, chaparral shrubland, and mixed woodland communities especially sites with dense vegetation, caves or other natural cavities, rocky outcrops ranging, and tree/brush edges. Elevation ranges between 1,000 and 3,500 ft. Nearest recorded occurrences are 25 mi south of the SEZ. About 2,833,446 acres of potentially suitable habitat occurs within the SEZ region.	185,274 acres of potentially suitable habitat lost (6.5% of available suitable habitat)	542,622 acres of potentially suitable habitat (19.2% of available potentially suitable habitat)	Moderate overall impact. Pre-disturbance surveys and avoiding or minimizing disturbance of habitats within the SEZ that serve as movement corridors could further reduce impacts.

[a] BLM-S = listed as a sensitive species by the BLM; CA-E = listed as endangered by the State of California; CA-S1 = ranked as S1 in the State of California; CA-S2 = ranked as S2 in the State of California; CA-T = listed as threatened by the State of California; ESA-T = listed as threatened under the ESA; ESA-UR = under review for listing under the ESA; FWS-SC = USFWS species of concern. An asterisk denotes that the listing status applies to populations only within the State of Arizona.

[b] For plant and invertebrate species, potentially suitable habitat was determined using CAReGAP and SWReGAP land cover types. For reptile, bird, and mammal species, potentially suitable habitat was determined using CAReGAP and SWReGAP habitat suitability models as well as CAReGAP and SWReGAP land cover models. Area of potentially suitable habitat for each species is presented for the SEZ region, defined as the area within 50 mi (80 km) of the SEZ center.

[c] Maximum area of potentially suitable habitat that could be affected relative to availability within the SEZ region. Habitat availability for each species within the region was determined using CAReGAP or SWReGAP habitat suitability and land cover models. This approach probably overestimates the amount of suitable habitat in the project area. Impacts of access road and transmission line construction, upgrade, or operation are not assessed in this evaluation because of the proximity of existing infrastructure to the SEZ.

[d] Direct effects within the SEZ consist of the ground-disturbing activities associated with construction and the maintenance of an altered environment associated with operations.

[e] Area of indirect effects was assumed to be the area adjacent to the SEZ within 5 mi (8 km) of the SEZ boundary. Indirect effects include effects from surface runoff, dust, noise, lighting, etc., from the SEZ, but do not include ground-disturbing activities. The potential degree of indirect effects would decrease with increasing distance away from the SEZ.

Footnotes continued on next page.

TABLE 9.4.12.1-1 (Cont.)

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[f] Overall impact magnitude categories were based on professional judgment and include (1) *small*: ≤1% of the population or its habitat would be lost, and the activity would not result in a measurable change in carrying capacity or population size in the affected area; (2) *moderate*: >1 but ≤10% of the population or its habitat, would be lost and the activity would result in a measurable but moderate (not destabilizing) change in carrying capacity or population size in the affected area; and (3) *large*: >10% of a population or its habitat would be lost and the activity would result in a large, measurable, and destabilizing change in carrying capacity or population size in the affected area. Note that much greater weight was given to the magnitude of direct effects because those effects would be difficult to mitigate. Programmatic design features would reduce most indirect effects to negligible levels.

[g] Species-specific mitigations are suggested here but final mitigations should be developed in consultation with state and federal agencies, and should be based on pre-disturbance surveys.

[h] Elevations in the areas of direct and indirect effect range from about 230 ft (70 m) to 3,800 ft (1,160 m).

[i] To convert acres to km^2, multiply by 0.004047.

[j] Species in bold text have been recorded or have designated critical habitat in the affected area.

effects (Figure 9.4.12.1-1; Table 9.4.12.1-1). The USGS desert tortoise model (Nussear et al. 2009) indicates that the majority of the SEZ is composed of less suitable habitat than the surrounding landscape (modeled suitability value ≤0.5 out of 1.0).

Designated critical habitat for this species does not occur on the SEZ, but adjacent critical habitat occurs south of the SEZ in the area of indirect effects within the Chuckwalla DWMA. Designated critical habitat for the desert tortoise also occurs within the area of indirect effects northwest of the SEZ within the Pinto Mountains DWMA. The Riverside East SEZ is situated between the two DWMAs (Figure 9.4.12.1-1), and provides connectivity between them and other Wildlife Habitat Management Areas (WHMAs) defined in the BLM NECO Plan (BLM and CDFG 2002) to facilitate the movement of desert tortoises and increase genetic diversity (Stout 2009).

9.4.12.1.2 BLM-Designated Sensitive Species

There are 25 BLM-designated sensitive species that may occur in the affected area of the Riverside East SEZ (Table 9.4.12.1-1). These BLM-designated sensitive species include the following (1) plants: alkali mariposa-lily, chaparral sand-verbena, creamy blazing star, giant Spanish-needle, Harwood's eriastrum, Latimer's woodland-gilia, Little San Bernardino Mountains linanthus, Munz's cholla, Orocopia sage, and white-margined beardtongue; (2) reptiles: Mojave fringe-toed lizard and rosy boa; (3) birds: Bendire's thrasher, ferruginous hawk, and western burrowing owl; and (4) mammals: California leaf-nosed bat, cave myotis, Nelson's bighorn sheep, pallid bat, Palm Springs pocket mouse, spotted bat, Townsend's big-eared bat, western mastiff bat, western small-footed bat, and western yellow bat. Of these species, the Orocopia sage, Bendire's thrasher, western burrowing owl, California leaf-nosed bat, cave myotis, Nelson's bighorn sheep, pallid bat, Townsend's big-eared bat, and western mastiff bat have been recorded in the affected area. Habitats in which these species are found, the amount of potentially suitable habitat in the affected area, and known locations of the species relative to the SEZ are discussed below and presented in Table 9.4.12.1-1. Additional life history information for these species is provided in Appendix J.

Alkali Mariposa-Lily

The alkali mariposa-lily is a perennial forb in the lily family that is known only from wetlands in the western Mojave Desert region of southern California. It inhabits alkaline seeps, springs, and meadows. The species is not known to occur on the SEZ, but potentially suitable habitat does occur there and in other portions of the affected area (Table 9.4.12.1-1). The nearest known occurrence of the species is about 40 mi (64 km) west of the Riverside East SEZ.

Chaparral Sand-Verbena

The chaparral sand-verbena is a flowering for that is endemic to southern California. It historically occurred in the vicinity of the Riverside East SEZ and within the area of indirect effects. The most recent recorded occurrences for this species are 23 mi (37 km) west of the SEZ. Although the species has not been recently recorded near the SEZ, potentially suitable sand dune habitat does occur there and in other portions of the affected area (Table 9.4.12.1-1).

Creamy Blazing-Star

The creamy blazing-star is an annual forb in the aster family that is endemic to the Mojave Desert in southern California. It inhabits desert creosotebush scrub communities on rocky and sandy substrates. The species is not known to occur on the SEZ, but potentially suitable habitat does occur there and in other portions of the affected area (Table 9.4.12.1-1). The nearest known occurrence of the species is about 45 mi (72 km) west of the Riverside East SEZ.

Giant Spanish-Needle

The giant Spanish-needle is a flowering forb endemic to sand dune habitats in the Sonoran Desert of southern California and southwestern Arizona. Populations are known to occur as near as 40 mi (64 km) south of the SEZ. Populations are not known to occur on the Riverside East SEZ, but suitable desert dune habitats may occur on the SEZ and in other portions of the affected area (Table 9.4.12.1-1).

Harwood's Eriastrum

The Harwood's eriastrum is an annual forb that is known only from the Mojave Desert in southern California where it inhabits desert dunes. The species is not known to occur on the SEZ, but potentially suitable habitat does occur there and in other portions of the affected area (Table 9.4.12.1-1). The nearest known occurrence of the species is about 15 mi (24 km) northwest of the Riverside East SEZ in the Pinto Mountains DWMA.

Latimer's Woodland-Gilia

The Latimer's woodland-gilia is an annual forb in the phlox family that is endemic to southern California from San Bernardino and Riverside Counties. It inhabits desert scrub, washes, and pinyon-juniper woodland communities on rocky or sandy substrates. The species is not known to occur on the SEZ, but potentially suitable habitat does occur there and in other portions of the affected area (Table 9.4.12.1-1). The nearest known occurrence of the species is about 30 mi (48 km) west of the Riverside East SEZ.

Little San Bernardino Mountains Linanthus

The Little San Bernardino Mountains linanthus is an annual forb in the phlox family that is endemic to southern California in Riverside and San Bernardino Counties. It inhabits desert dunes and sandy flats within creosotebush and Joshua tree woodland communities. The species is not known to occur on the SEZ, but potentially suitable habitat does occur there and in other portions of the affected area (Table 9.4.12.1-1). The nearest known occurrence of the species is about 30 mi (48 km) west of the Riverside East SEZ.

Munz's Cholla

The Munz's cholla is a tree-like cactus endemic to southern California where it is known only from the Chocolate Mountains in Imperial and Riverside Counties as near as 20 mi (32 km) south of the SEZ. The species inhabits Sonoran Desert creosotebush scrub communities. The species is not known to occur on the Riverside East SEZ, but potentially suitable habitat occurs on the SEZ and in other portions of the affected area (Table 9.4.12.1-1).

Orocopia Sage

The Orocopia sage is a flowering evergreen shrub that is endemic to southern California in dry desert washes and floodplains. The species is known to occur as near as 2 mi (3 km) south of the Riverside East SEZ within the area of indirect effects. Potentially suitable habitat for the species occurs on the SEZ and in other portions of the affected area (Table 9.4.12.1-1).

White-Margined Beardtongue

The white-margined beardtongue is a perennial forb in the figwort family that occurs in the deserts of Arizona, California, and Nevada. In California, it is known from fewer than 20 locations. It inhabits desert dunes and desert scrub communities of the Mojave Desert. The nearest known occurrence of the species is about 50 mi (80 km) north of the Riverside East SEZ; potentially suitable habitat exists on the SEZ and in other portions of the affected area (Table 9.4.12.1-1).

Mojave Fringe-Toed Lizard

The Mojave fringe-toed lizard is a fairly small, smooth-skinned lizard that inhabits desert sand dune habitats the Mojave Desert of southern California. The species occurs in scattered populations in dunes composed of fine, loose, windblown sand deposits. The nearest known occurrence of the species is about 25 mi (40 km) north of the Riverside East SEZ; potentially suitable dune habitats are known to occur on the SEZ and in other portions of the affected area (Table 9.4.12.1-1).

Rosy Boa

The rosy boa is a heavy-bodied snake that inhabits desert scrublands, rocky deserts, and canyons in southern California south of the Death Valley region. The nearest known occurrence is from Joshua Tree NP, approximately 25 mi (40 km) west of the Riverside East SEZ. Potentially suitable habitat occurs on the SEZ and in other portions of the affected area (Table 9.4.12.1-1).

Bendire's Thrasher

The Bendire's thrasher is a small neotropical migrant bird that is a summer breeding resident in southern California. This species inhabits desert succulent shrub and Joshua tree habitats in the Mojave Desert where it is associated with sagebrush, pinyon-juniper woodlands, cholla cactus, Joshua tree, palo verde, mesquite, and agave species. The species is known to occur as near as the Chuckwalla DWMA, 2 mi (3 km) south of the Riverside East SEZ in the area of indirect effects. Potentially suitable scrub and wash habitats may occur in the SEZ and other portions of the affected area (Table 9.4.12.1-1).

Ferruginous Hawk

The ferruginous hawk is a winter resident and migrant in the Riverside East SEZ region. The species inhabits open grasslands, sagebrush flats, desert scrub, and the edges of pinyon-juniper woodlands. It is known to occur in Riverside County, and potentially suitable foraging habitat occurs on the Riverside East SEZ and in other portions of the affected area (Table 9.4.12.1-1).

Western Burrowing Owl

The western burrowing owl is a year-round resident of open, dry grasslands and desert habitats in southern California and Arizona. The species occurs locally in open areas with sparse vegetation. The species is known to occur as near as 1 mi (1.6 km) east of the Riverside East SEZ in the area of indirect effects. Potentially suitable foraging and nesting habitat may occur in the SEZ and other portions of the affected area (Table 9.4.12.1-1). The availability of nest sites (burrows) within the affected area has not been determined; shrubland habitat that may be suitable for either foraging or nesting occurs throughout the affected area.

California Leaf-Nosed Bat

The California leaf-nosed bat is a large-eared bat with a leaflike flap of protective skin on the tip of its nose. It primarily occurs along the Colorado River, from southern Nevada, through Arizona and California, to Baja California and Sinaloa Mexico. The species forages in a variety of desert habitats, including desert riparian, desert wash, desert scrub, and palm oasis. It roosts in caves, crevices, and mines. The nearest recorded occurrences are from the Palen/McCoy Wilderness within 2 mi (3 km) of the SEZ in the area of indirect effects. Potentially suitable habitat may occur on the Riverside East SEZ and in other portions of the affected area (Table 9.4.12.1-1). The potentially suitable habitat on the SEZ and in the area of indirect effects could include foraging and roosting habitat. On the basis of an evaluation of land cover types, approximately 5,600 acres (23 km^2) and 115,700 acres (468 km^2) of rocky cliffs and outcrops on the SEZ and in the area of direct effects, respectively, could be potentially suitable roosting habitat for this species.

Cave Myotis

The cave myotis is known to occur in the lower Colorado River Basin in southern California and Arizona. It inhabits desert scrublands, washes, and riparian habitats. This species roosts in colonies in caves. The nearest recorded occurrences are from the Mule Mountains ACEC about 2 mi (3 km) south of the Riverside East SEZ. Potentially suitable habitat may occur on the SEZ and in other portions of the affected area (Table 9.4.12.1-1). The potentially suitable habitat on the SEZ and in the area of indirect effects could include foraging and roosting habitat. On the basis of an evaluation of land cover types, approximately 5,600 acres (23 km^2) and 115,700 acres (468 km^2) of rocky cliffs and outcrops on the SEZ and in the area of direct effects, respectively, could be potentially suitable roosting habitat for this species.

Nelson’s Bighorn Sheep

The Nelson’s bighorn sheep is one of several subspecies of bighorn sheep known to occur in the southwestern United States. This species occurs in desert mountain ranges in Arizona, California, Nevada, Oregon, and Utah. The Nelson’s bighorn sheep uses primarily montane shrubland, forest, and grassland habitats and may utilize desert valleys as corridors for travel between range habitats. In California, the species is known from the desert mountain ranges from the White Mountains, south to the San Bernardino Mountains, and southeastward to the Mexican border. The Nelson’s bighorn sheep uses primarily montane shrubland, forest, and grassland habitats, and may utilize desert valleys as corridors for travel between range habitats. The nearest recorded occurrences are from the Joshua Tree Wilderness and the Chuckwalla DWMA, about 2 mi (3 km) north, west, and south of the SEZ. The SEZ and other portions of the affected area may provide important habitat for sheep travelling between ranges (Table 9.4.12.1-1).

Pallid Bat

The pallid bat is a large, pale bat with large ears that is locally common in desert grasslands and shrublands in the southwestern United States. It roosts in caves, crevices, and mines. The species is a year-round resident throughout southern California. The nearest recorded occurrence is from the Chuckwalla Mountains Wilderness, approximately 5 mi (8 km) south of the Riverside East SEZ. Potentially suitable habitat may occur on the SEZ and in other portions of the affected area (Table 9.4.12.1-1). The potentially suitable habitat on the SEZ and in the area of indirect effects could include foraging and roosting habitat. On the basis of an evaluation of land cover types, approximately 5,600 acres (23 km^2) and 115,700 acres (468 km^2) of rocky cliffs and outcrops on the SEZ and in the area of direct effects, respectively, could be potentially suitable roosting habitat for this species.

Palm Springs Pocket Mouse

The Palm Springs pocket mouse is a pocket mouse subspecies known only to occur in Riverside County within the Coachella Valley. This species inhabits desert scrub and grassland communities on sandy soils. The nearest recorded occurrences are 25 mi (40 km) west of the SEZ. Potentially suitable habitat occurs on the Riverside East SEZ and in other portions of the affected area (Table 9.4.12.1-1).

Spotted Bat

The spotted bat is considered a rare year-round resident of southern California where it forages in mountain foothills, desert shrublands, grasslands, washes, riparian areas, and mixed conifer forests. The species roosts in rock crevices along cliffs. The nearest recorded occurrences are approximately 40 mi (64 km) west of the Riverside East SEZ. Potentially suitable habitat may occur on the SEZ and in other portions of the affected area (Table 9.4.12.1-1). The potentially suitable habitat on the SEZ and in the area of indirect effects could include foraging and roosting habitat. On the basis of an evaluation of land cover types, approximately 5,600 acres (23 km^2) and 115,700 acres (468 km^2) of rocky cliffs and outcrops on the SEZ and in the area of direct effects, respectively, could be potentially suitable roosting habitat for this species.

Townsend's Big-Eared Bat

The Townsend's big-eared bat is widely distributed throughout the western United States. In California, the species forages year-round in a wide variety of desert and non-desert habitats. The species roosts in caves, mines, tunnels, buildings, and other man-made structures. The nearest recorded occurrences are approximately 4 mi (6 km) southeast of the Riverside East SEZ. Potentially suitable habitat may occur on the SEZ and in other portions of the affected area (Table 9.4.12.1-1). The potentially suitable habitat on the SEZ and in the area of indirect effects could include foraging and roosting habitat. On the basis of an evaluation of land cover types, approximately 5,600 acres (23 km^2) and 115,700 acres (468 km^2) of rocky cliffs and outcrops on the SEZ and in the area of direct effects, respectively, could be potentially suitable roosting habitat for this species.

Western Mastiff Bat

The western mastiff bat is a large uncommon resident of southern California and western Arizona. The species forages in many open semiarid habitats, including conifer and deciduous woodlands, shrublands, grassland, and urban areas. It roosts in crevices, trees, and buildings. The nearest recorded occurrences are 5 mi (8 km) west of the Riverside East SEZ. Potentially suitable habitat may occur on the SEZ and in other portions of the affected area (Table 9.4.12.1-1). The potentially suitable habitat on the SEZ and in the area of indirect effects could include foraging and roosting habitat. On the basis of an evaluation of land cover types, approximately 5,600 acres (23 km^2) and 115,700 acres (468 km^2) of rocky cliffs and outcrops on the SEZ and in the area of direct effects, respectively, could be potentially suitable roosting habitat for this species.

Western Small-Footed Myotis

The western small-footed myotis is a common year-round resident in desert habitats of southern California. It occurs in a variety of desert woodland and riparian habitats. This species roosts in caves, buildings, mines, and rock crevices. The nearest recorded occurrences are from the Chocolate Mountains, approximately 30 mi (48 km) south of the Riverside East SEZ. Potentially suitable habitat may occur on the SEZ and in other portions of the affected area (Table 9.4.12.1-1). The potentially suitable habitat on the SEZ and in the area of indirect effects could include foraging and roosting habitat. On the basis of an evaluation of land cover types, approximately 5,600 acres (23 km^2) and 115,700 acres (468 km^2) of rocky cliffs and outcrops on the SEZ and in the area of direct effects, respectively, could be potentially suitable roosting habitat for this species.

Western Yellow Bat

The western yellow bat is an uncommon year-round resident in the foothill and desert regions of southern California and southwestern Arizona. It occurs in a variety of desert wash, riparian, and palm oasis habitats. This species roosts in trees. The nearest recorded occurrences are from the vicinity of Blythe, California, approximately 6 mi (10 km) east of the Riverside East SEZ. Potentially suitable habitat may occur on the SEZ and in other portions of the affected area (Table 9.4.12.1-1). The potentially suitable habitat on the SEZ and in the area of indirect effects could include foraging and roosting habitat. On the basis of an evaluation of land cover types, approximately 223 acres (1 km^2) and 335 acres (1.5 km^2) of riparian woodlands on the SEZ and in the area of direct effects, respectively, could be potentially suitable roosting habitat for this species.

9.4.12.1.3 State-Listed Species

There are two species listed by the State of California that may occur in the Riverside East SEZ affected area—the desert tortoise and Gila woodpecker (Table 9.4.12.1-1). The desert tortoise is listed as threatened under the CESA; this species is discussed in Section 9.4.12.1.1 because of its status under the ESA.

The Gila woodpecker is listed as an endangered species under the CESA. It is a fairly uncommon resident in southern California and southwestern Arizona, where it occurs in desert riparian and wash habitats along the lower Colorado River Basin. Additional life history information for this species is provided in Appendix J. The nearest recorded occurrence for this species is from the Colorado River, approximately 6 mi (10 km) east of the Riverside East SEZ. According to the CAReGAP habitat suitability model, potentially suitable habitat for this species does not occur on the SEZ; however, potentially suitable foraging and nesting habitat may occur in portions of the area of indirect effects (Table 9.4.12.1-1).

9.4.12.1.4 Rare Species

There are 68 rare species (i.e., state rank of S1 or S2 in California or a species of concern by the State of California or USFWS) that may occur in the affected area of the Riverside East SEZ (Table 9.4.12.1-1). Of these species, there are 42 that have not been discussed as ESA-listed (Section 9.4.12.1.1), BLM-designated sensitive (Section 9.4.12.1.2), or state-listed (Section 9.4.12.1.3).

9.4.12.2 Impacts

This section discusses the potential for impacts on special status species from utility-scale solar energy development within the proposed Riverside East SEZ. The types of impacts that special status species could incur from construction and operation of utility-scale solar energy facilities are discussed in Section 5.10.4.

The assessment of impacts on special status species is based on available information on the presence of species in the affected area, as presented in Section 9.4.12.1, following the analysis approach described in Appendix M. It is assumed that, prior to development, surveys would be conducted to determine the presence of special status species and their habitats in and near areas where ground-disturbing activities would occur. Additional NEPA assessments, ESA consultations, and coordination with state natural resource agencies may be needed to address project-specific impacts more thoroughly. These assessments and consultations could result in additional required actions to avoid, minimize, or mitigate impacts on special status species (see Section 9.4.12.3).

Solar energy development within the Riverside East SEZ could affect a variety of habitats (see Section 9.4.10). These impacts on habitats could in turn affect special status species that are dependent on those habitats. Based on CNDDB records and information provided by the USFWS, there are 29 special status species known to occur in the affected area of the Riverside East SEZ (Section 9.4.12.1). These species are listed in bold in Table 9.4.12.1-1. No other special status species have been recorded in the affected area (CDFG 2010b). Other special status species may occur on the SEZ or within the affected area based on the presence of potentially suitable habitat. As discussed in Section 9.4.12.1, this approach to identifying the species that could occur in the affected area probably overestimates the number of species that actually occur in the affected area, and may therefore overestimate impacts on some special status species.

Potential direct and indirect impacts on special status species within the SEZ and in the area of indirect effect outside the SEZ are presented in Table 9.4.12.1-1. In addition, the overall potential magnitude of impacts on each species (assuming programmatic design features are in place) is presented along with any potential species-specific mitigation measures that could further reduce impacts.

Impacts on special status species could occur during all phases of development (construction, operation, and decommissioning and reclamation) of a utility-scale solar energy project within the SEZ. Construction and operation activities could result in short- or long-term impacts on individuals and their habitats, especially if these activities are sited in areas where special status species are known to or could occur. As presented in Section 9.4.1.2, impacts of access road and transmission line construction, upgrade, or operation are not assessed in this evaluation because of the proximity of existing infrastructure to the SEZ.

Direct impacts would result from habitat destruction or modification. It is assumed that direct impacts would occur only within the SEZ where ground-disturbing activities are expected to occur. Indirect impacts could result from surface water and sediment runoff from disturbed areas, fugitive dust generated by project activities, accidental spills, harassment, and lighting. No ground-disturbing activities associated with project facilities are anticipated to occur within the area of indirect effects. Decommissioning of facilities and reclamation of disturbed areas after operations cease could result in short-term negative impacts to individuals and habitats adjacent to project areas, but long-term benefits would accrue if original land contours and native plant communities were restored in previously disturbed areas.

The successful implementation of programmatic design features (discussed in Appendix A, Section A.2.2) would reduce direct impacts on some special status species, especially those that depend on habitat types that can be easily avoided (e.g., dunes and sand transport systems, playa and desert wash habitats). Indirect impacts on special status species could be reduced to negligible levels by implementing programmatic design features, especially those engineering controls that would reduce runoff, sedimentation, spills, and fugitive dust.

9.4.12.2.1 Impacts on Species Listed under the ESA

The desert tortoise is the only ESA-listed species that has the potential to occur in the affected area of the Riverside East SEZ and is the only ESA-listed species the USFWS identified as potentially affected by solar energy development on the SEZ (Stout 2009). The desert tortoise is known to occur in the Chuckwalla DWMA adjacent to the southern boundary of the SEZ in the area of indirect effects; populations are also known to occur in Joshua Tree NP and Pinto Mountains DWMA, adjacent to the western and northwestern border of the SEZ (Figure 9.4.12.1-1). According to the CAReGAP habitat suitability model, approximately

185,274 acres (750 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations of solar energy development on the SEZ (Table 9.4.12.1-1). This direct effects area represents about 4.4% of available suitable habitat of the desert tortoise in the region. The USGS desert tortoise model (Nussear et al. 2009) indicates that the majority of the SEZ is composed of less suitable habitat than the surrounding landscape (modeled suitability value ≤0.5 out of 1.0). About 542,622 acres (2,200 km^2) of suitable habitat occurs in the area of potential indirect effects; this area represents about 12.9% of the available suitable habitat in the region (Table 9.4.12.1-1).

On the basis of desert tortoise surveys conducted in Joshua Tree NP, adjacent to the western border of the SEZ, the USFWS estimated that full-scale solar energy development on the SEZ may directly affect up to 2,865 desert tortoises on the SEZ (Stout 2009). In addition to direct impacts, development on the SEZ could indirectly affect desert tortoises by fragmenting and degrading adjacent habitat (refer to Section 5.10.4 for a discussion of possible indirect impacts). Fragmentation would be exacerbated by the installation of exclusionary fencing at the perimeter of the SEZ or individual project areas. The SEZ is situated between the Chuckwalla and Pinto Mountains DWMAs (these DWMAs also contain USFWS-designated critical habitat), and WHMAs within the SEZ may provide important connectivity for desert tortoise movements between the DWMAs (BLM and CDFG 2002; Stout 2009). Therefore, development on the SEZ may disrupt desert tortoise population dynamics in nearby DWMAs and designated critical habitat.

The overall impact on the desert tortoise from construction, operation, and decommissioning of utility-scale solar energy facilities within the Riverside East SEZ is considered moderate because the amount of potentially suitable habitat for this species in the area of direct effects represents between 1% and 10% of potentially suitable habitat in the region and the implementation of programmatic design features alone is unlikely to substantially reduce these impacts. Avoidance of all potentially suitable habitats for this species is not a feasible means of mitigating impacts because these habitats (desert scrub) are widespread throughout the area of direct effects.

Development of actions to reduce impacts (e.g., reasonable and prudent alternatives, reasonable and prudent measures, and terms and conditions) for the desert tortoise, including development of a survey protocol, avoidance measures, minimization measures, and, potentially, translocation actions and compensatory mitigation, would require formal consultation with the USFWS under Section 7 of the ESA. These consultations may be used to authorize incidental take statements per Section 10 of the ESA (if necessary). In addition, the CESA provides authority to the CDFG to regulate potential impacts on the desert tortoise and other species listed under the CESA. Therefore, formal consultation with the CDFG would also be required to permit the incidental take of desert tortoises in the SEZ.

There are inherent dangers to tortoises associated with their capture, handling, and translocation from the SEZ. These actions, if done improperly, can result in injury or death. To minimize these risks, and as stated above, the desert tortoise translocation plan should be developed in consultation with the USFWS and CDGF, and follow the *Guidelines for Handling Desert Tortoises During Construction Projects* (Desert Tortoise Council 1994) and other current translocation guidance provided by the USFWS and CDFG. Consultation will identify potentially suitable recipient locations, density thresholds for tortoise populations in recipient locations, procedures for pre-disturbance clearance surveys and tortoise handling, as well as disease testing and post-translocation monitoring and reporting requirements. Despite some risk of mortality or decreased fitness, translocation is widely accepted as a useful strategy for the conservation of the desert tortoise (Field et al. 2007).

To offset impacts of solar development on the SEZ, compensatory mitigation may be needed to balance the acreage of habitat lost with acquisition of lands that would be improved and protected for desert tortoise populations (USFWS 1994). Compensation can be accomplished by improving the carrying capacity for the desert tortoise on the acquired lands. Other mitigation actions may include funding for the enhancement of desert tortoise habitat on existing federal lands. Consultations with the USFWS and CDGF would be necessary to determine the appropriate mitigation ratio to acquire, enhance, and preserve desert tortoise compensation lands.

9.4.12.2.2 Impacts on BLM-Designated Sensitive Species

Impacts on the 25 BLM-designated sensitive species that have potentially suitable habitat within the affected area of the Riverside East SEZ are discussed below.

Alkali Mariposa-Lily

The alkali mariposa-lily is not known to occur in the affected area of the Riverside East SEZ; however, approximately 1,570 acres (6 km^2) of potentially suitable desert playa habitat on the SEZ could be directly affected by construction and operations (Table 9.4.12.1-1). This direct impact area represents about 2.3% of available suitable habitat in the region. About 828 acres (3 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 1.2% of the available suitable habitat in the region (Table 9.4.12.1-1).

The overall impact on the alkali mariposa-lily from construction, operation, and decommissioning of utility-scale solar energy facilities within the Riverside East SEZ is considered moderate because the amount of potentially suitable habitat for this species in the area of direct effects represents greater than 1% but less than 10% of potentially suitable habitat in the region. The implementation of programmatic design features may be sufficient to reduce indirect impacts to negligible levels.

Potentially suitable habitat for the alkali mariposa-lily occurs in a limited portion of the SEZ (primarily associated with Ford Dry Lake and Palen Lake) and could be completely avoided during the development of facilities and protected from indirect effects. Alternatively, avoiding or minimizing disturbance to occupied habitats also would reduce impacts on this species. If avoidance or minimization is not a feasible option, plants could be translocated from the area of direct effects to protected areas that would not be affected directly or indirectly by future development. Alternatively, or in combination with translocation, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. The protection and enhancement of existing occupied or suitable habitats could compensate for habitats lost to development. A comprehensive mitigation strategy that uses one or more of these options could be designed to completely offset the impacts of development. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Chaparral Sand-Verbena

The chaparral sand-verbena historically occurred on the SEZ, but it is currently only known to occur outside of the area of indirect effects approximately 23 mi (37 km) from the SEZ. Approximately 26,798 acres (108 km^2) of potentially suitable desert sand dune habitat within the SEZ may be directly affected by project construction and operations (Table 9.4.12.1-1). This direct impact area represents 31.8% of available suitable habitat in the region. About 15,987 acres (65 km^2) of potentially suitable habitat occurs within the area of indirect effects; this area represents about 19.0% of the available suitable habitat in the region (Table 9.4.12.1-1).

The overall impact on the chaparral sand-verbena from construction, operation, and decommissioning of utility-scale solar energy facilities within the Riverside East SEZ is considered large because the amount of potentially suitable habitat for this species in the area of direct effects represents 10% or more of potentially suitable habitat in the region. The implementation of programmatic design features would reduce indirect impacts to negligible levels.

Chaparral sand-verbena habitat (desert sand dunes) occupies portions of the SEZ that could be avoided during the development of facilities and protected from indirect effects. In conjunction with the implementation of programmatic design features, avoiding or minimizing disturbance to occupied habitats and desert dunes and sand transport systems and applying the mitigation measures described previously for the alkali mariposa-lily could further reduce impacts on this species. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Creamy Blazing-Star

The creamy blazing-star is not known to occur in the affected area of the Riverside East SEZ; however, approximately 109,933 acres (445 km^2) of potentially suitable desert scrub habitat on the SEZ could be directly affected by construction and operations (Table 9.4.12.1-1). This direct impact area represents about 5.0% of available suitable habitat in the region. About 229,999 acres (931 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 10.4% of the available suitable habitat in the region (Table 9.4.12.1-1).

The overall impact on the creamy blazing-star from construction, operation, and decommissioning of utility-scale solar energy facilities within the Riverside East SEZ is considered moderate because the amount of potentially suitable habitat for this species in the area of direct effects represents greater than 1% but less than 10% of potentially suitable habitat in the region. The implementation of programmatic design features alone is unlikely to substantially reduce impacts.

Avoidance of all potentially suitable habitats is not feasible to mitigate impacts on the creamy blazing-star because some of these habitats (desert scrub) are widespread throughout the area of direct effect. However, impacts could be reduced to negligible levels with the implementation of programmatic design features and the mitigation options described previously for the alkali mariposa-lily. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Giant Spanish-Needle

The giant Spanish-needle is not known to occur in the affected area of the Riverside East SEZ; however, approximately 26,798 acres (108 km^2) of potentially suitable desert dune habitat on the SEZ could be directly affected by construction and operations (Table 9.4.12.1-1). This direct impact area represents 31.8% of available suitable habitat in the SEZ region. About 15,987 acres (65 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 19.0% of the available suitable habitat in the SEZ region (Table 9.4.12.1-1).

The overall impact on the giant Spanish-needle from construction, operation, and decommissioning of utility-scale solar energy facilities within the Riverside East SEZ is considered large because the amount of potentially suitable habitat for this species in the area of direct effects represents 10% or more of potentially suitable habitat in the SEZ region. The implementation of programmatic design features would reduce indirect impacts to negligible levels.

Giant Spanish-needle habitat (desert dunes) occupies portions of the SEZ that could be avoided during the development of solar facilities and protected from indirect effects. In conjunction with the implementation of programmatic design features, avoiding or minimizing disturbance to occupied habitats and desert dunes and sand transport systems and applying the mitigation measures described previously for the alkali mariposa-lily could further reduce impacts on this species. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Harwood's Eriastrum

The Harwood's eriastrum is not known to occur in the affected area of the Riverside East SEZ; however, approximately 26,798 acres (108 km^2) of potentially suitable desert dune habitat on the SEZ could be directly affected by construction and operations (Table 9.4.12.1-1). This direct impact area represents about 31.8% of available suitable habitat in the region. About 15,987 acres (65 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 19.0% of the available suitable habitat in the SEZ region (Table 9.4.12.1-1).

The overall impact on the Harwood's eriastrum from construction, operation, and decommissioning of utility-scale solar energy facilities within the Riverside East SEZ is considered large because the amount of potentially suitable habitat for this species in the area of direct effects represents 10% or more of potentially suitable habitat in the SEZ region. The implementation of programmatic design features would reduce indirect impacts to negligible levels.

Harwood's eriastrum habitat (desert dunes) occupies portions of the SEZ that could be avoided during the development of solar facilities and protected from indirect effects. In conjunction with the implementation of programmatic design features, avoiding or minimizing disturbance to occupied habitats and desert dunes and sand transport systems and applying the mitigation measures described previously for the alkali mariposa-lily could further reduce impacts on this species. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Latimer's Woodland-Gilia

The Latimer's woodland-gilia is not known to occur in the affected area of the Riverside East SEZ; however, approximately 136,472 acres (552 km^2) of potentially suitable desert scrub and wash habitat on the SEZ could be directly affected by construction and operations (Table 9.4.12.1-1). This direct impact area represents about 4.7% of available suitable habitat in the SEZ region. About 314,674 acres (1,273 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 10.8% of the available suitable habitat in the region (Table 9.4.12.1-1).

The overall impact on the Latimer's woodland gilia from construction, operation, and decommissioning of utility-scale solar energy facilities within the Riverside East SEZ is considered moderate because the amount of potentially suitable habitat for this species in the area of direct effects represents greater than 1% but less than 10% of potentially suitable habitat in the region. The implementation of programmatic design features alone is unlikely to substantially reduce impacts.

Avoidance of all potentially suitable habitats is not feasible to mitigate impacts on the Latimer's woodland gilia because some of these habitats (desert scrub) are widespread throughout the area of direct effect. However, impacts could be reduced to negligible levels with the implementation of mitigation options described previously for the alkali mariposa-lily. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Little San Bernardino Mountains Linanthus

The Little San Bernardino Mountains linanthus is not known to occur in the affected area of the Riverside East SEZ; however, approximately 26,798 acres (108 km^2) of potentially suitable desert dune habitat on the SEZ could be directly affected by construction and operations (Table 9.4.12.1-1). This direct impact area represents about 31.8% of available suitable habitat in the region. About 15,987 acres (65 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 19.0% of the available suitable habitat in the SEZ region (Table 9.4.12.1-1).

The overall impact on the Little San Bernardino Mountains linanthus from construction, operation, and decommissioning of utility-scale solar energy facilities within the Riverside East SEZ is considered large because the amount of potentially suitable habitat for this species in the area of direct effects represents 10% or more of potentially suitable habitat in the SEZ region. The implementation of programmatic design features would reduce indirect impacts to negligible levels.

Little San Bernardino Mountains linanthus habitat (desert dunes) occupies portions of the SEZ that could be avoided during the development of solar facilities and protected from indirect effects. In conjunction with the implementation of programmatic design features, avoiding or minimizing disturbance to occupied habitats and desert dunes and sand transport systems and applying the mitigation measures described previously for the alkali mariposa-lily could further reduce impacts on this species. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Munz’s Cholla

The Munz’s cholla is not known to occur in the affected area of the Riverside East SEZ; however, approximately 171,716 acres (695 km^2) of potentially suitable desert scrub and wash habitats on the SEZ could be directly affected by construction and operations (Table 9.4.12.1-1). This direct impact area represents about 4.1% of available suitable habitat in the SEZ region. About 570,180 acres (2,307 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 13.6% of the available suitable habitat in the SEZ region (Table 9.4.12.1-1).

The overall impact on the Munz’s cholla from construction, operation, and decommissioning of utility-scale solar energy facilities within the Riverside East SEZ is considered moderate because the amount of potentially suitable habitat for this species in the area of direct effects represents greater than 1% but less than 10% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features alone is unlikely to substantially reduce impacts.

Avoidance of all potentially suitable habitats is not a feasible way to mitigate impacts on the Munz’s cholla because these habitats (mostly desert scrub) are widespread throughout the area of direct effect. However, impacts could be reduced to negligible levels with the implementation of programmatic design features and the mitigation options described previously for the alkali mariposa-lily. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Orocopia Sage

The Orocopia sage is known from the Chuckwalla DWMA within the Riverside East SEZ area of indirect effects. Approximately 134,909 acres (546 km^2) of potentially suitable desert scrub and wash habitats on the SEZ could be directly affected by construction and operations (Table 9.4.12.1-1). This direct impact area represents about 4.7% of available suitable habitat in the SEZ region. About 309,323 acres (1,252 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 10.8% of the available suitable habitat in the region (Table 9.4.12.1-1).

The overall impact on the Orocopia sage from construction, operation, and decommissioning of utility-scale solar energy facilities within the Riverside East SEZ is considered moderate because the amount of potentially suitable habitat for this species in the area of direct effects represents greater than 1% but less than 10% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features alone is unlikely to substantially reduce impacts.

Avoidance of all potentially suitable habitats is not a feasible way to mitigate impacts on the Orocopia sage because potentially suitable desert scrub habitats are widespread throughout the area of direct effect. However, impacts could be reduced to negligible levels with the implementation of programmatic design features and the mitigation options described previously for the alkali mariposa-lily. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

White-Margined Beardtongue

The white-margined beardtongue is not known to occur on the Riverside East SEZ; however, approximately 138,294 acres (560 km^2) of potentially suitable desert scrub and dune habitat on the SEZ could be directly affected by construction and operations (Table 9.4.12.1-1). This direct impact area represents about 5.8% of available suitable habitat in the SEZ region. About 251,337 acres (1,017 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 10.6% of the available suitable habitat in the SEZ region (Table 9.4.12.1-1).

The overall impact on the white-margined beardtongue from construction, operation, and decommissioning of utility-scale solar energy facilities within the Riverside East SEZ is considered moderate because the amount of potentially suitable habitat for this species in the area of direct effects represents greater than 1% but less than 10% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features alone is unlikely to substantially reduce impacts.

Avoidance of all potentially suitable habitats is not feasible to mitigate impacts on the white-margined beardtongue because some of these habitats (desert scrub) are widespread throughout the area of direct effect. However, impacts could be reduced to negligible levels with the implementation of programmatic design features and the mitigation options described previously for the alkali mariposa-lily. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Mojave Fringe-Toed Lizard

The Mojave fringe-toed lizard is not known to occur on the Riverside East SEZ; however, according to the CAReGAP habitat suitability model, approximately 140,506 acres (569 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 9.4.12.1-1). This direct impact area represents about 7.6% of available suitable habitat in the SEZ region. About 380,038 acres (1,538 km^2) of potentially suitable foraging habitat occurs in the area of potential indirect effect; this area represents about 20.6% of the available suitable habitat in the region (Table 9.4.12.1-1).

The overall impact on the Mojave fringe-toed lizard from construction, operation, and decommissioning of utility-scale solar energy facilities within the Riverside East SEZ is considered moderate because the amount of potentially suitable habitat for this species in the area of direct effects represents greater than 1% but less than 10% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features would reduce indirect impacts to negligible levels.

Avoidance of all potentially suitable habitats is not a feasible option for mitigating impacts on the Mojave fringe-toed lizard because, according to the CAReGAP habitat suitability model, these habitats are widespread throughout the area of direct effects. However, avoiding or minimizing disturbance to occupied habitats, dune and sand transport systems, and desert wash habitats would reduce impacts on this species. If avoidance or minimization is not feasible, impacts could be reduced by conducting pre-disturbance surveys and avoiding or minimizing impacts on occupied habitats on the SEZ. If avoidance or minimization is not a feasible option, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. The protection and enhancement of existing occupied or suitable habitats could compensate for habitats lost to development. A comprehensive mitigation strategy that uses one or both of these options could be designed to completely offset the impacts of development. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Rosy Boa

The rosy boa is not known to occur on the Riverside East SEZ; however, according to the CAReGAP habitat suitability model, approximately 185,274 acres (750 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 9.4.12.1-1). This direct impact area represents about 4.4% of available habitat in the

SEZ region. About 544,126 acres (2,200 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 13.0% of the available suitable habitat in the region (Table 9.4.12.1-1).

The overall impact on the rosy boa from construction, operation, and decommissioning of utility-scale solar energy facilities within the Riverside East SEZ is considered moderate because the amount of potentially suitable habitat for this species in the area of direct effects represents greater than 1% but less than 10% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to reduce indirect impacts to negligible levels.

Avoidance of all potentially suitable habitats is not a feasible option for mitigating impacts on the rosy boa because potentially suitable desertscrub habitats are widespread throughout the area of direct effects. Impacts could be reduced to negligible levels through implementing programmatic design features and avoiding or minimizing disturbance to occupied habitats on the SEZ. If avoidance or minimization is not a feasible option, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. The protection and enhancement of existing occupied or suitable habitats could compensate for habitats lost to development. A comprehensive mitigation strategy that uses one or both of these options could be designed to completely offset the impacts of development. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Bendire's Thrasher

The Bendire's thrasher is a summer resident in southern California and is known to occur in the Chuckwalla DWMA within the area of indirect effects. According to the CAReGAP land cover model, approximately 111,496 acres (451 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations of solar energy development on the SEZ (Table 9.4.12.1-1). This direct effects area represents about 4.4% of available suitable habitat in the region. About 235,350 acres (952 km^2) of suitable habitat occurs in the area of potential indirect effects; this area represents about 9.3% of the available suitable habitat in the region (Table 9.4.12.2-2).

The overall impact on the Bendire's thrasher from construction, operation, and decommissioning of utility-scale solar energy facilities within the Riverside East SEZ is considered moderate because the amount of potentially suitable habitat for this species in the area of direct effects represents greater than 1% but less than 10% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to reduce indirect impacts to negligible levels.

Avoidance of all potentially suitable habitats is not feasible to mitigate impacts on the Bendire's thrasher, because potentially suitable foraging habitats (desert scrub) are widespread throughout the area of direct effect. Impacts could be reduced to small or negligible levels through the implementation of programmatic design features and by avoiding or minimizing disturbance to occupied nesting habitats on the SEZ, such as those that may occur in ironwood communities in desert wash habitats. If avoidance or minimization is not a feasible option, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable nesting habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or both of these options could be designed to completely offset the impacts of development. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

Ferruginous Hawk

The ferruginous hawk is a winter resident in the Riverside East SEZ region. According to the CAReGAP land cover model, approximately 112,197 acres (454 km^2) of potentially suitable foraging habitat on the SEZ could be directly affected by construction and operations (Table 9.4.12.1-1). This direct impact area represents about 5.7% of available suitable habitat in the region. About 287,942 acres (1,165 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 14.6% of the available suitable habitat in the region (Table 9.4.12.1-1).

The overall impact on the ferruginous hawk from construction, operation, and decommissioning of utility-scale solar energy facilities within the Riverside East SEZ is considered moderate because direct effects would occur only on potentially suitable foraging habitat, and the amount of this habitat in the area of direct effects represents between 1 and 10% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to reduce indirect impacts to negligible levels. Avoidance of direct impacts on all potentially suitable foraging habitat is not a feasible option for mitigating impacts on the ferruginous hawk because potentially suitable shrubland is widespread throughout the area of direct effects and readily available in other portions of the affected area.

Western Burrowing Owl

The western burrowing owl is known to occur in the SEZ area of indirect effects within 1 mi (1.6 km) east of the SEZ. According to the CAReGAP habitat suitability model, approximately 202,844 acres (821 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 9.4.12.1-1). This direct impact area represents 4.4% of available suitable habitat in the region. About 652,982 acres (2,642 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 14.0% of the available suitable habitat in the region (Table 9.4.12.1-1). Most of this area could serve as foraging and nesting habitat (shrublands). The abundance of burrows suitable for nesting on the SEZ and in the area of indirect effects has not been determined.

The overall impact on the western burrowing owl from construction, operation, and decommissioning of utility-scale solar energy facilities within the Riverside East SEZ is considered moderate because the amount of potentially suitable habitat for this species in the area of direct effects represents greater than 1% but less than 10% of potentially suitable habitat in the SEZ region. The implementation of programmatic design features is expected to be sufficient to reduce indirect impacts on this species to negligible levels.

Avoidance of all potentially suitable habitats is not feasible to mitigate impacts on the western burrowing owl because potentially suitable desert scrub habitats are widespread throughout the area of direct effect. However, impacts on the western burrowing owl could be reduced by avoiding or minimizing disturbance to occupied burrows and habitat in the area of direct effects. If avoidance or minimization of disturbance to all occupied habitat is not a feasible option, a compensatory mitigation plan could be developed and implemented to mitigate direct effects. The protection and enhancement of existing occupied or suitable habitats could compensate for habitats lost to development. A comprehensive mitigation strategy that used one or both of these options could be designed to completely offset the impacts of development. The need for mitigation should first be determined by conducting pre-disturbance surveys for the species and its habitat on the SEZ.

California Leaf-Nosed bat

The California leaf-nosed bat is a year-round resident in southern California within the Riverside East SEZ region. Approximately 142,335 acres (576 km^2) of potentially suitable foraging habitat on the SEZ could be directly affected by construction and operations (Table 9.4.12.1-1). This direct impact area represents about 3.6% of available suitable habitat in the region. About 430,378 acres (1,742 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 10.8% of the available suitable habitat in the region (Table 9.4.12.1-1). The potentially suitable habitat on the SEZ is primarily foraging habitat (desert shrubland). However, on the basis of an evaluation of land cover types, approximately 5,600 acres (23 km^2) of rocky cliffs and outcrops that may be potentially suitable roosting habitat occurs on the SEZ. An additional 115,700 acres (468 km^2) of rocky cliffs and outcrops occurs in the area of direct effects.

The overall impact on the California leaf-nosed bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the Riverside East SEZ is considered moderate because the amount of potentially suitable habitat for this species in the area of direct effects represents greater than 1% but less than 10% of potentially suitable foraging habitat in the SEZ region. The implementation of programmatic design features is expected to reduce indirect impacts to negligible levels.

Avoidance of direct impacts on all foraging habitat (shrublands) is not feasible because suitable foraging habitat (shrublands) is widespread in the area of direct effect and readily available in other portions of the affected area. However, avoiding or minimizing disturbance of all potentially suitable roosting habitat (rocky cliffs and outcrops) on the SEZ is feasible and could reduce impacts. If avoiding or minimizing disturbance of all occupied or suitable roosting habitat is not a feasible option, a compensatory mitigation plan could be developed and implemented to mitigate direct effects. The protection and enhancement of existing occupied or suitable habitats could compensate for habitats lost to development. A comprehensive mitigation strategy that uses one or both of these options could be designed to completely offset the impacts of development. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat within the area of direct effects.

Cave Myotis

The cave myotis is a year-round resident in the lower Colorado River Basin within the Riverside East SEZ region. Approximately 142,335 acres (576 km^2) of potentially suitable foraging habitat on the SEZ could be directly affected by construction and operations (Table 9.4.12.1-1). This direct impact area represents about 3.4% of available suitable habitat in the region. About 430,704 acres (1,742 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 10.4% of the available suitable habitat in the region (Table 9.4.12.1-1). The potentially suitable habitat on the SEZ is primarily foraging habitat (desert shrubland). However, on the basis of an evaluation of land cover types, approximately 5,600 acres (23 km^2) of rocky cliffs and outcrops that may be potentially suitable roosting habitat occurs on the SEZ. An additional 115,700 acres (468 km^2) of rocky cliffs and outcrops occurs in the area of direct effects.

The overall impact on the cave myotis from construction, operation, and decommissioning of utility-scale solar energy facilities within the Riverside East SEZ is considered moderate because the amount of potentially suitable habitat for this species in the area of direct effects represents greater than 1% but less than 10% of potentially suitable foraging habitat in the SEZ region. The implementation of programmatic design features is expected to reduce indirect impacts to negligible levels.

Avoidance of direct impacts on all foraging habitat (shrublands) is not feasible because suitable foraging habitat (shrublands) is widespread in the area of direct effects and readily available in other portions of the affected area. However, avoiding or minimizing disturbance of all potentially suitable roosting habitat (rocky cliffs and outcrops) on the SEZ is feasible and could reduce impacts. If avoiding or minimizing disturbance of all occupied or suitable roosting habitat is not a feasible option, a compensatory mitigation plan could be developed and implemented to mitigate direct effects. The protection and enhancement of existing occupied or suitable habitats could compensate for habitats lost to development. A comprehensive mitigation strategy that uses one or both of these options could be designed to completely offset the impacts of development. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat within the area of direct effects.

Nelson's Bighorn Sheep

The Nelson's bighorn sheep (also called the desert bighorn sheep) is known to occur in the affected area from the Joshua Tree Wilderness and Chuckwalla DWMA within 2 mi (3 km) north, west, and south of the Riverside East SEZ. Sheep may utilize habitats within the SEZ as migration corridors between these ranges. According to the CAReGAP habitat suitability model, approximately 42,020 acres (170 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 9.4.12.1-1). This direct impact area represents about 2.2% of available suitable habitat in the SEZ region. About 223,604 acres (905 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 11.8% of the available suitable habitat in the SEZ region (Table 9.4.12.1-1).

The overall impact on the Nelson's bighorn sheep from construction, operation, and decommissioning of utility-scale solar energy facilities within the Riverside East SEZ is considered moderate because the amount of potentially suitable habitat for this species in the area of direct effects represents greater than 1% but less than 10% of potentially suitable habitat in the region. The implementation of programmatic design features alone is unlikely to substantially reduce impacts.

Impacts on the Nelson's bighorn sheep could be reduced to small or negligible levels by conducting pre-construction surveys and avoiding or minimizing disturbance to occupied habitats and important movement corridors on the SEZ. If avoidance or minimization is not a feasible option, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. Compensation could involve the protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that used one or both of these options could be designed to completely offset the impacts of development. The need for mitigation should first be determined by conducting pre-construction surveys for the species and its habitat on the SEZ.

Pallid Bat

The pallid bat is a year-round resident in southern California within the Riverside East SEZ region. According to the CAReGAP land cover model, approximately 117,359 acres (475 km^2) of potentially suitable foraging habitat on the SEZ could be directly affected by construction and operations (Table 9.4.12.1-1). This direct impact area represents about 3.2% of available suitable habitat in the region. About 351,380 acres (1,421 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 9.6% of the available suitable habitat in the region (Table 9.4.12.1-1). The potentially suitable habitat on the SEZ is primarily foraging habitat (desert shrubland). However, on the basis of an evaluation of land cover types, approximately 5,600 acres (23 km^2) of rocky cliffs and outcrops that may be potentially suitable roosting habitat occurs on the SEZ. An additional 115,700 acres (468 km^2) of rocky cliffs and outcrops occurs in the area of direct effects.

The overall impact on the pallid bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the Riverside East SEZ is considered moderate because the amount of potentially suitable habitat for this species in the area of direct effects represents greater than 1% but less than 10% of potentially suitable foraging habitat in the SEZ region. The implementation of programmatic design features is expected to reduce indirect impacts to negligible levels.

Avoidance of direct impacts on all foraging habitat (shrublands) is not feasible because suitable foraging habitat (shrublands) is widespread in the area of direct effects and readily available in other portions of the affected area. However, avoiding or minimizing disturbance of all potentially suitable roosting habitat (rocky cliffs and outcrops) on the SEZ is feasible and could reduce impacts. If avoiding or minimizing disturbance of all occupied or suitable roosting habitat is not a feasible option, a compensatory mitigation plan could be developed and implemented to mitigate direct effects. The protection and enhancement of existing occupied or suitable habitats could compensate for habitats lost to development. A comprehensive mitigation strategy that uses one or both of these options could be designed to completely offset the impacts of development. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat within the area of direct effects.

Palm Springs Pocket Mouse

The Palm Springs pocket mouse is not known to occur in the Riverside East SEZ affected area; however, according to the CAReGAP habitat suitability model, approximately 198,472 acres (803 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 9.4.12.1-1). This direct impact area represents about 5.3% of available suitable habitat in the SEZ region. About 512,782 acres (2,075 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 13.7% of the available suitable foraging habitat in the SEZ region (Table 9.4.12.1-1).

The overall impact on the Palm Springs pocket mouse from construction, operation, and decommissioning of utility-scale solar energy facilities within the Riverside East SEZ is considered moderate because the amount of potentially suitable habitat for this species in the area of direct effects represents greater than 1% but less than 10% of potentially suitable foraging habitat in the SEZ region. The implementation of programmatic design features alone is unlikely to substantially reduce impacts.

Avoidance of all potentially suitable habitats is not a feasible option for mitigating impacts on the Palm Springs pocket mouse because potentially suitable desertscrub habitats are widespread throughout the area of direct effects. Impacts could be reduced to negligible levels through the implementation of programmatic design features and avoidance or minimization of disturbance to occupied habitats on the SEZ. If avoidance or minimization is not a feasible option, a compensatory mitigation plan could be developed and implemented to mitigate direct effects on occupied habitats. The protection and enhancement of existing occupied or suitable habitats could compensate for habitats lost to development. A comprehensive mitigation strategy that uses one or both of these options could be designed to completely offset the impacts of development. The need for mitigation should first be determined by conducting preconstruction surveys for the species and its habitat on the SEZ.

Spotted Bat

The spotted bat is considered to be a rare year-round resident in the Riverside East SEZ region. According to the CAReGAP land cover model, approximately 111,719 acres (452 km^2) of potentially suitable habitat on the SEZ could be directly affected by construction and operations (Table 9.4.12.1-1). This direct impact area represents about 4.7% of available suitable foraging habitat in the SEZ region. About 235,684 acres (954 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 10.0% of the available suitable habitat in the SEZ region (Table 9.4.12.1-1). The potentially suitable habitat on the SEZ is primarily foraging habitat (desert shrubland); however, suitable roosting habitat may occur on the SEZ. On the basis of an evaluation of land cover types, approximately 5,600 acres (23 km^2) of rocky cliffs and outcrops that may be potentially suitable roosting habitat occurs on the SEZ. An additional 115,700 acres (468 km^2) of rocky cliffs and outcrops occurs in the area of direct effects.

The overall impact on the spotted bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the Riverside East SEZ is considered moderate because the amount of potentially suitable habitat for this species in the area of direct effects represents greater than 1% but less than 10% of potentially suitable foraging habitat in the SEZ region. The implementation of programmatic design features is expected to reduce indirect impacts to negligible levels.

Avoidance of direct impacts on all foraging habitat (shrublands) is not feasible because suitable foraging habitat (shrublands) is widespread in the area of direct effects and readily available in other portions of the affected area. However, avoiding or minimizing disturbance of all potentially suitable roosting habitat (rocky cliffs and outcrops) on the SEZ is feasible and could reduce impacts. If avoiding or minimizing disturbance of all occupied or suitable roosting habitat is not feasible, a compensatory mitigation plan could be developed and implemented to mitigate direct effects. The protection and enhancement of existing occupied or suitable habitats could compensate for habitats lost to development. A comprehensive mitigation strategy that uses one or both of these options could be designed to completely offset the impacts of development. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat within the area of direct effects.

Townsend's Big-Eared Bat

The Townsend's big-eared bat is a year-round resident in the Riverside East SEZ region. According to the CAReGAP land cover model, approximately 202,912 acres (821 km^2) of potentially suitable foraging habitat on the SEZ could be directly affected by construction and operations (Table 9.4.12.1-1). This direct impact area represents about 4.0% of available suitable habitat in the SEZ region. About 655,256 acres (2,651 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 12.9% of the available suitable habitat in the SEZ region (Table 9.4.12.1-1). The potentially suitable habitat on the SEZ is primarily foraging habitat (desert shrubland). However, on the basis of an evaluation of land cover types, approximately 1,500 acres (6 km^2) of rocky cliffs and outcrops that may be potentially suitable roosting habitat occurs on the SEZ. An additional 41,000 acres (166 km^2) of rocky cliffs and outcrops occurs in the area of direct effects.

The overall impact on the Townsend's big-eared bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the Riverside East SEZ is considered moderate because the amount of potentially suitable habitat for this species in the area of direct effects represents greater than 1% but less than 10% of potentially suitable foraging habitat in the SEZ region. The implementation of programmatic design features is expected to reduce indirect impacts to negligible levels.

Avoidance of direct impacts on all foraging habitat (shrublands) is not feasible because suitable foraging habitat (shrublands) is widespread in the area of direct effects and readily available in other portions of the affected area. However, avoiding or minimizing disturbance of all potentially suitable roosting habitat (rocky cliffs and outcrops) on the SEZ is feasible and could reduce impacts. If avoiding or minimizing disturbance of all occupied or suitable roosting habitat is not feasible, a compensatory mitigation plan could be developed and implemented to mitigate direct effects. The protection and enhancement of existing occupied or suitable habitats could compensate for habitats lost to development. A comprehensive mitigation strategy that uses one or both of these options could be designed to completely offset the impacts of development. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat within the area of direct effects.

Western Mastiff Bat

The western mastiff bat is a year-round resident in the Riverside East SEZ region. According to the CAReGAP land cover model, approximately 202,912 acres (821 km^2) of potentially suitable foraging habitat on the SEZ could be directly affected by construction and operations (Table 9.4.12.1-1). This direct impact area represents about 5.0% of available suitable habitat in the SEZ region. About 655,256 acres (2,651 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 16.1% of the available suitable habitat in the SEZ region (Table 9.4.12.1-1). The potentially suitable habitat on the SEZ is primarily foraging habitat (desert shrubland). However, on the basis of an evaluation of land cover types, approximately 5,600 acres (23 km^2) of rocky cliffs and outcrops that may be potentially suitable roosting habitat occurs on the SEZ. An additional 115,700 acres (468 km^2) of rocky cliffs and outcrops occurs in the area of direct effects.

The overall impact on the western mastiff bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the Riverside East SEZ is considered moderate because the amount of potentially suitable habitat for this species in the area of direct effects represents greater than 1% but less than 10% of potentially suitable foraging habitat in the SEZ region. The implementation of programmatic design features is expected to reduce indirect impacts to negligible levels.

Avoidance of direct impacts on all foraging habitat (shrublands) is not feasible because suitable foraging habitat (shrublands) is widespread in the area of direct effects and readily available in other portions of the affected area. However, avoiding or minimizing disturbance of all potentially suitable roosting habitat (rocky cliffs and outcrops) on the SEZ is feasible and could reduce impacts. If avoiding or minimizing disturbance of all occupied or suitable roosting habitat is not feasible, a compensatory mitigation plan could be developed and implemented to mitigate direct effects. The protection and enhancement of existing occupied or suitable habitats to compensate for habitats lost to development. A comprehensive mitigation strategy that uses one or both of these options could be designed to completely offset the impacts of development. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat within the area of direct effects.

Western Small-Footed Myotis

The western small-footed myotis is a year-round resident in the Riverside East SEZ region. According to the CAReGAP land cover model, approximately 25,199 acres (102 km^2) of potentially suitable foraging habitat on the SEZ could be directly affected by construction and operations (Table 9.4.12.1-1). This direct impact area represents about 3.8% of available suitable foraging habitat in the SEZ region. About 79,658 acres (322 km^2) of potentially suitable foraging habitat occurs in the area of potential indirect effect; this area represents about 12.0% of the available suitable foraging habitat in the SEZ region (Table 9.4.12.1-1). The potentially suitable habitat on the SEZ is primarily foraging habitat (desert shrubland). However, on the basis of an evaluation of land cover types, approximately 5,600 acres (23 km^2) of rocky cliffs and outcrops that may be potentially suitable roosting habitat occurs on the SEZ. An additional 115,700 acres (468 km^2) of rocky cliffs and outcrops occurs in the area of direct effects.

The overall impact on the western small-footed myotis from construction, operation, and decommissioning of utility-scale solar energy facilities within the Riverside East SEZ is considered moderate because the amount of potentially suitable habitat for this species in the area of direct effects represents greater than 1% but less than 10% of potentially suitable foraging habitat in the SEZ region. The implementation of programmatic design features is expected to reduce indirect impacts to negligible levels.

Avoidance of direct impacts on all foraging habitat (shrublands) is not feasible because suitable foraging habitat (shrublands) is widespread in the area of direct effects and readily available in other portions of the affected area. However, avoiding or minimizing disturbance of all potentially suitable roosting habitat (rocky cliffs and outcrops) on the SEZ is feasible and could reduce impacts. If avoiding or minimizing disturbance of all occupied or suitable roosting habitat is not feasible, a compensatory mitigation plan could be developed and implemented to mitigate direct effects. The protection and enhancement of existing occupied or suitable habitats could compensate for habitats lost to development. A comprehensive mitigation strategy that uses one or both of these options could be designed to completely offset the impacts of development. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat within the area of direct effects.

Western Yellow Bat

The western yellow bat is a year-round resident in the Riverside East SEZ region. According to the CAReGAP land cover model, approximately 25,199 acres (102 km^2) of potentially suitable foraging habitat on the SEZ could be directly affected by construction and operations (Table 9.4.12.1-1). This direct impact area represents about 1.9% of available suitable foraging habitat in the SEZ region. About 79,658 acres (322 km^2) of potentially suitable foraging habitat occurs in the area of potential indirect effect; this area represents about 5.9% of the available suitable foraging habitat in the SEZ region (Table 9.4.12.1-1). The potentially suitable habitat on the SEZ is primarily foraging habitat (desert shrubland). However, on the basis of an evaluation of land cover types, approximately 223 acres (1 km^2) of riparian woodlands that may be potentially suitable roosting habitat occurs on the SEZ. An additional 335 acres (1.5 km^2) of riparian woodlands occurs in the area of direct effects.

The overall impact on the western yellow bat from construction, operation, and decommissioning of utility-scale solar energy facilities within the Riverside East SEZ is considered moderate because the amount of potentially suitable habitat for this species in the area of direct effects represents greater than 1% but less than 10% of potentially suitable foraging habitat in the SEZ region. The implementation of programmatic design features is expected to reduce indirect impacts to negligible levels.

Avoidance of direct impacts on all foraging habitat (shrublands) is not feasible because suitable foraging habitat (shrublands) is widespread in the area of direct effects and readily available in other portions of the affected area. However, avoiding or minimizing disturbance of all potentially suitable roosting habitat (riparian woodlands) on the SEZ is feasible and could reduce impacts. If avoiding or minimizing disturbance of all occupied or suitable roosting habitat is not feasible, a compensatory mitigation plan could be developed and implemented to mitigate direct effects. The protection and enhancement of existing occupied or suitable habitats could compensate for habitats lost to development. A comprehensive mitigation strategy that uses one or both of these options could be designed to completely offset the impacts of development. The need for mitigation, other than programmatic design features, should be determined by conducting pre-disturbance surveys for the species and its habitat within the area of direct effects.

9.4.12.2.3 Impacts on State-Listed Species

There are two species listed by the State of California that could occur in the affected area of the Riverside East SEZ (Section 9.4.12.1.3; Table 9.4.12.1-1)—desert tortoise and Gila woodpecker. Impacts on the desert tortoise are discussed in Section 9.4.12.2.1 because of the status of this species under the ESA; impacts on the Gila woodpecker are discussed below.

The Gila woodpecker is not known to occur in the affected area of the Riverside East SEZ. However, the species is known to occur along the Colorado River about 6 mi (10 km) east of the SEZ. According to the CAReGAP habitat suitability model, there is no suitable habitat for this species on the SEZ (Table 9.4.12.1-1). However, about 300 acres (1 km^2) of potentially suitable habitat occurs in the area of potential indirect effect; this area represents about 0.1% of the available suitable habitat in the SEZ region (Table 9.4.12.1-1).

The overall impact on the Gila woodpecker from construction, operation, and decommissioning of utility-scale solar energy facilities within the Riverside East SEZ is considered small because no suitable habitat occurs on the SEZ and only indirect effects are possible. The implementation of programmatic design features would reduce indirect impacts to negligible levels. No species-specific mitigation for the Gila woodpecker is feasible or warranted.

9.4.12.2.4 Impacts on Rare Species

There are 69 species with a state rank of S1 or S2 in California or considered a species of concern by the State of California or USFWS that may occur in the affected area of the Riverside East SEZ. Impacts have been previously discussed for 27 of these species that are also listed under the ESA (Section 9.4.12.2.1), BLM-designated sensitive (Section 9.4.12.2.2), or state-listed (Section 9.4.12.2.3). Impacts on the remaining 42 rare species that do not have any other special status designation are presented in Table 9.4.12.1-1.

9.4.12.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A, Section A.2.2, would greatly reduce or eliminate the potential for effects of utility-scale solar energy development on special status species. While some SEZ-specific design features are best established when project details are being considered, some design features can be identified at this time, including the following:

- Pre-disturbance surveys should be conducted within the SEZ to determine the presence and abundance of special status species, including those identified in Table 9.4.12.1-1; disturbance to occupied habitats for these species should be avoided or minimized to the extent practicable. If avoiding or minimizing impacts to occupied habitats is not possible, translocation of individuals from areas of direct effects, or compensatory mitigation of direct effects on occupied habitats could reduce impacts. A comprehensive mitigation strategy for special status species that uses one or more of these options to offset the impacts of development should be developed in coordination with the appropriate federal and state agencies.

- Disturbance of desert playa and wash habitats within the SEZ should be avoided or minimized to the extent practicable. In particular, development should be avoided in and near Ford Dry Lake, Palen Lake, and McCoy Wash within the SEZ. Adverse impacts on the following species could be reduced with the avoidance of these playas and desert wash habitats on the SEZ: alkali mariposa-lily, California saw-grass, Coves' cassia, Emory's crucifixion-thorn, jackass-clover, Salt Spring checkerbloom, sand evening-primrose, Roberts' rhopalolemma bee, and crissal thrasher.

- Avoidance or minimization of disturbance to sand dune habitats and sand transport systems on the SEZ could reduce impacts on several special status species, including the chaparral sand-verbena, dwarf germander, giant Spanish-needle, Harwood's eriastrum, jackass-clover, little San Bernardino Mountains linanthus, and Mojave fringe-toed lizard.

- Consultations with the USFWS and the CDFG should be conducted to address the potential for impacts on the desert tortoise, a species listed as threatened under the ESA and CESA. Consultation would identify an appropriate survey protocol, avoidance measures, and, if appropriate, reasonable and prudent alternatives, reasonable and prudent measures, and terms and conditions for incidental take statements.

- Harassment or disturbance of special status species and their habitats in the affected area should be mitigated. This can be accomplished by identifying any additional sensitive areas and implementing necessary protection measures based upon consultation with the USFWS and CDFG.

If these SEZ-specific design features are implemented in addition to required programmatic design features, impacts on the special status and rare species would be reduced.

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9.4.13 Air Quality and Climate

9.4.13.1 Affected Environment

9.4.13.1.1 Climate

The proposed Riverside East SEZ is located in the eastern portion of Riverside County in southeastern California. The SEZ, with an average elevation of 580 ft (177 m), straddles the southernmost portion of the Mojave Desert and northernmost portion of the Sonoran Desert, which has an extremely arid climate—mild winters and hot summers, large daily temperature swings, scant precipitation, high evaporation rates, low relative humidity, and abundant sunshine. Meteorological data collected at the Blythe Airport,[7] which is about 1.5 mi (2.4 km) east of the eastern boundary of the Riverside East SEZ, are summarized below.

A wind rose from the Blythe Airport in Blythe, California, for the 5-year period 2005 to 2009 and taken at a level of 33 ft (10 m) is presented in Figure 9.4.13.1-1 (NCDC 2010a).[8] During this period, the annual average wind speed at the airport was about 7.6 mph (3.4 m/s), with a prevailing wind direction from the south (about 13% of the time) and secondarily from the north–northwest (about 9% of the time), parallel to nearby mountain ranges. Wind directions alternated between north–northwest (March, May, August, and October) and south (the rest of the months) throughout the year. In California, wind flow is generally from the west or northwest throughout the year, but the prevailing wind direction for a given site is influenced by local terrain (NCDC 2010b). Wind speeds categorized as calm (less than 1.1 mph [0.5 m/s]) occurred frequently (almost one-fifth of the time) because of the stable conditions caused by strong radiative cooling from late night to sunrise. Average wind speeds were relatively uniform by season; the highest was in summer and fall, at 7.8 mph (3.5 m/s); lower in winter, at 7.4 mph (3.3 m/s), respectively; and lowest in spring, at 7.2 mph (3.2 m/s).

For the period 1948 to 2009, the annual average temperature at the Blythe Airport was 73.7°F (23.2°C) (WRCC 2010b). December was the coldest month with an average minimum temperature of 41.2°F (5.1°C), and July was the warmest month with an average maximum of 108.4°F (42.4°C). On most days in summer, daytime maximum temperatures were in the 100s, and minimums were in the low 70s or higher. The minimum temperatures recorded were below freezing (≤32°F [0°C]) on about 2 to 3 days of the colder months (December and January), but subzero temperatures were never recorded. During the same period, the highest temperature, 123°F (50.6°C), was reached in June 1994, and the lowest, 20°F (–6.7°C), in January 1971.

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7 Eagle Mountain station is located about 0.6 mi (1.0 km) from the western edge of the SEZ at an elevation of about 970 ft (296 m), which is higher than the elevation of Blythe Airport, at about 390 ft (119 m). The station also has collected temperature and precipitation data since 1933. Temperatures are a little lower and precipitation is a little higher at the Eagle Mountain station than at the Blythe Airport.

8 Note that the Riverside East SEZ is spread over a wide area, about 50 mi (80 km) east–west and 25 mi (40 km) north–south and is in complex terrains. Accordingly, wind patterns at a location of interest might vary depending on elevation, orientation, and proximity to nearby mountains.

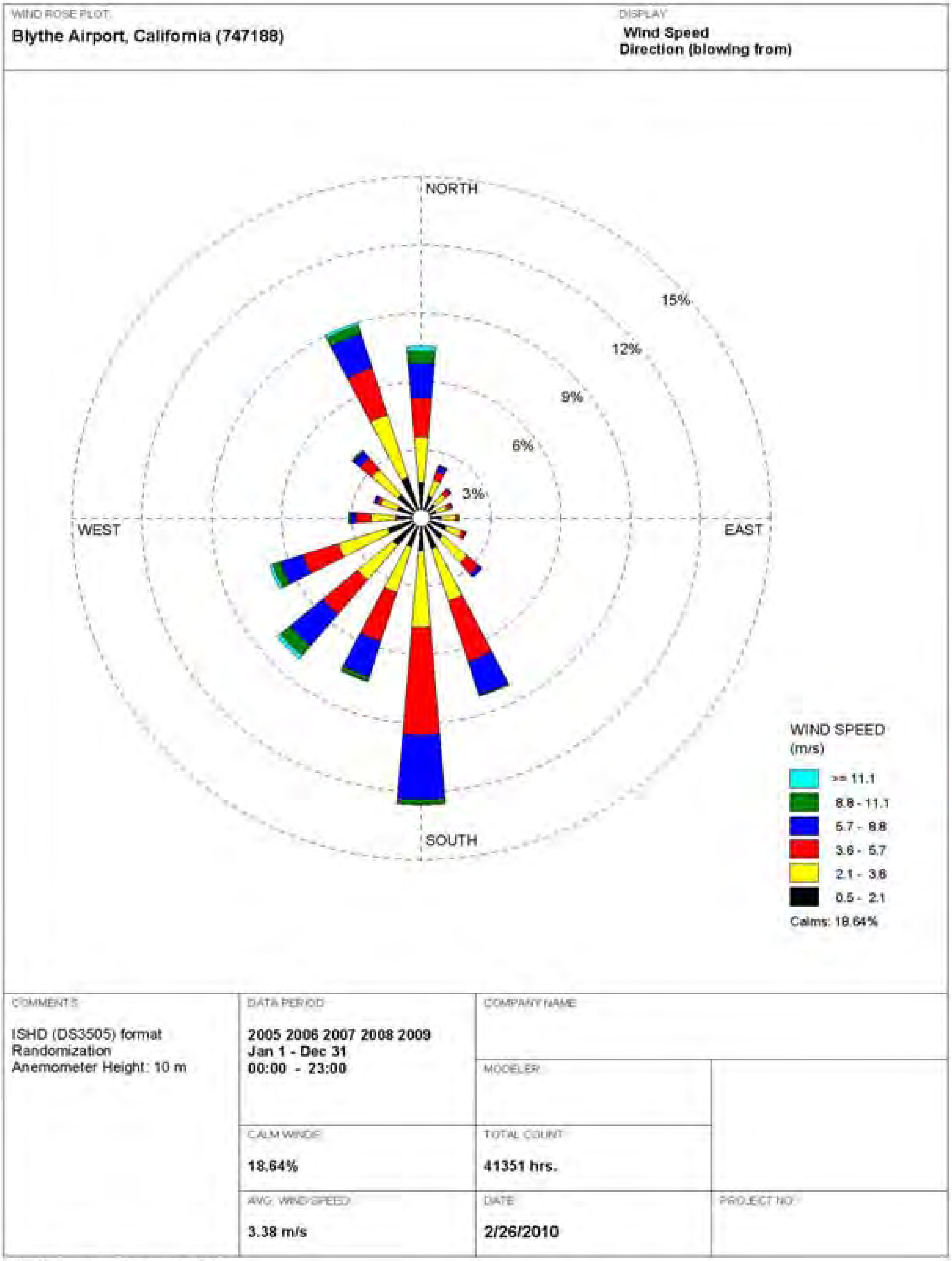

FIGURE 9.4.13.1-1 Wind Rose at 33-ft (10-m) Height at Blythe Airport, Blythe, California, 2005–2009 (Source: NCDC 2010a)

In a typical year, about 176 days had a maximum temperature of ≥90°F (32.2°C), while more than 5 days had a minimum temperature at or below freezing.

Pacific air masses lose most of their moisture on the windward side of mountain ranges parallel to the California coastline. Thus, leeward areas like the Riverside East SEZ experience a lack of precipitation. For the period 1948 to 2009, annual precipitation at the Blythe Airport averaged about 3.53 in. (9.0 cm) (WRCC 2010b). There is an average of 17 days annually with measurable precipitation (0.01 in. [0.025 cm] or higher). About 37% of the annual precipitation occurs during winter months, and 15% in spring, and the rest in summer and fall in almost equal amounts. No measurable snowfall was recorded at the Blythe Airport

Because the area surrounding the proposed Riverside East SEZ is far from major water bodies (more than 120 mi [193 km]) and because surrounding mountain ranges block air masses from penetrating into the area, severe weather events, such as hurricanes and tornadoes, are rare.

Since 1993, 137 floods (about 70% of which were flash floods), with peaks in July and August, have been reported in Riverside County (NCDC 2010c) and caused 6 deaths, 14 injuries, and considerable property and crop damage in total.

In Riverside County, 25 hail storms in total have been reported since 1960 and caused 2 injuries and minor property and crop damage. Hail measuring 2.75 in. (7.0 cm) in diameter was reported in 1960. In Riverside County, 112 high-wind events, peaking in winter months, have been reported since 1996 and caused 8 deaths, 68 injuries, and significant property and crop damage (NCDC 2010c). A high-wind event with a maximum wind speed of 120 mph (53.5 m/s) occurred in 1999. Since 1973, 87 thunderstorm wind events, peaking in summer months, have been reported and caused some property damage and minor crop damage. Many thunderstorms in California are accompanied by little to no precipitation, and lightning strikes sometimes cause forest fires (NCDC 2010b).

Since 1998, 15 dust storms have been reported in Riverside County (NCDC 2010c). The ground surface of the SEZ is covered predominantly with gravelly loams of alluvial fan terraces, which have relatively moderate dust storm potential. High winds can trigger large amounts of blowing dust in areas of Riverside County that have dry and loose soils with sparse vegetation. Dust storms can deteriorate air quality and visibility and have adverse effects on health..

Hurricanes and tropical storms formed off the coast of Central America and Mexico weaken over the cold waters off the California coast. Accordingly, hurricanes rarely hit California. Historically, four tropical storms/depressions have passed within 100 mi (160 km) of the proposed Riverside East SEZ (CSC 2010). Tornadoes in Riverside County, which encompasses the proposed Riverside East SEZ, occur infrequently. In the period 1950 to June 2010, a total of 19 tornadoes (0.3 per year) were reported in Riverside County (NCDC 2010c). However, most tornadoes occurring in Riverside County were relatively weak (i.e., 1 was uncategorized, 16 were weak F0 or F1, and 2 were strong F2 or F3 on the Fujita tornado scale). Several of these tornadoes caused two injuries and some property damage in total. Most tornadoes in Riverside County were reported far from the proposed Riverside East SEZ, except one F3 and one F0 tornadoes, which hit the area about 4 mi (6 km) east and 1 mi (1.6 km) south of the SEZ.

9.4.13.1.2 Existing Air Emissions

Riverside County has many industrial emission sources, which are mainly concentrated over the Valley Region near the City of Riverside. More than ten point source emissions are located around the proposed SEZ, mostly to the east in Blythe, and their annual emissions are relatively minor, except for a major source, the Southern California Gas Company compressor station in Blythe. Mobile source emissions are substantial, because the county is crossed by several interstate highways, including I-10, I-15, and I-215. Data on annual emissions of criteria pollutants and VOCs in Riverside County are presented in Table 9.4.13.1-1 for 2002 (WRAP 2009). Emission data are classified into six source categories: point, area, onroad mobile, nonroad mobile, biogenic, and fire (wildfires, prescribed fires, agricultural fires, structural fires). In 2002, nonroad sources were major contributors to total SO_2 emissions (about 47%) and secondary contributors to total NO_x emissions (about 27%). Onroad sources were major contributors to NO_x and CO emissions (about 61% and 64%, respectively) and secondary contributors to SO_2 emissions (about 31%). Biogenic sources (i.e., vegetation—including trees, plants, and crops—and soils) that release naturally occurring emissions accounted for most VOC emissions (about 87%). Area sources were primary contributors to PM emissions, which accounted for about 88% of PM_{10} and 67% of $PM_{2.5}$. Point and fire sources are minor contributors to criteria pollutants and VOCs in Riverside County.

TABLE 9.4.13.1-1 Annual Emissions of Criteria Pollutants and VOCs in Riverside County, California, Encompassing the Proposed Riverside East SEZ, 2002[a]

Pollutant[b]	Emissions (tons/yr)
SO_2	785
NO_x	55,220
CO	240,193
VOCs	267,693
PM_{10}	22,651
$PM_{2.5}$	6,934

a Includes point, area, onroad and nonroad mobile, biogenic, and fire emissions.

b Notation: CO = carbon monoxide; NO_x = nitrogen oxides; $PM_{2.5}$ = particulate matter with a diameter of ≤2.5 μm; PM_{10} = particulate matter with a diameter of ≤10 μm; SO_2 = sulfur dioxide; and VOCs = volatile organic compounds.

Source: WRAP (2009).

In 2006, California produced about 483.9 MMt of *gross*[9] carbon dioxide equivalent (CO_2e)[10] emissions (CARB 2010a). Gross greenhouse gas (GHG) emissions in California increased by about 12% from 1990 to 2006, which was three-fourths of the increase in the national rate (about 16%). In 2006, transportation (38%) and electricity use (22%) were the primary contributors to gross GHG emission sources in California. Fossil fuel use in the

9 Excluding GHG emissions removed as a result of forestry and other land uses and excluding GHG emissions associated with exported electricity.

10 A measure used to compare the emissions from various GHGs on the basis of their global warming potential, defined as the cumulative radiative forcing effects of a gas over a specified time horizon resulting from the emission of a unit mass of gas relative to a reference gas, CO_2. The CO_2e for a gas is derived by multiplying the mass of the gas by the associated global warming potential.

residential, commercial, and industrial sectors combined accounted for about 29% of total state emissions. California's *net* emissions were about 479.8 MMt CO_2e, considering carbon sinks from forestry activities and agricultural soils throughout the state. The U.S. Environmental Protection Agency (EPA 2009a) also estimated 2005 emissions in California. Its estimate of CO_2 emissions from fossil fuel combustion was 390.6 MMt, which was comparable to the state's estimate. The transportation and residential, commercial, and industrial sectors accounted for about 59% and 30% of the CO_2 emissions total, respectively, while electric power generation accounted for the remainder (about 11%).

9.4.13.1.3 Air Quality

CAAQS address the same six criteria pollutants as the NAAQS (CARB 2010b; EPA 2010a): SO_2, NO_2, CO, O_3, PM_{10}, $PM_{2.5}$, and Pb. CAAQS are more stringent than NAAQS for most criteria pollutants. In addition, California has set standards for some pollutants not addressed by NAAQS—visibility-reducing particles, sulfates, hydrogen sulfide, and vinyl chloride. The NAAQS and CAAQS for criteria pollutants are presented in Table 9.4.13.1-2.

Most of Riverside County is located administratively within the Southeast Desert Intrastate AQCR (Title 40, Part 81, Section 167 of the *Code of Federal Regulations* [40 CFR 81.167]), along with parts of Kern, Los Angeles, and San Bernardino Counties, and all of Imperial County. In addition, the Riverside East SEZ is located within the Mojave Desert Air Basin, one of 15 geographic air basins designated for the purpose of managing air resources in California, which also includes the desert portions of Kern, Los Angeles, Riverside, and San Bernardino Counties. Currently, the area surrounding the proposed SEZ is designated as being in unclassifiable/attainment of NAAQS for all criteria pollutants (40 CFR 81.305). However, the area is designated as a nonattainment area for O_3 and PM_{10} based on CAAQS (CARB 2010c).

With a low population density, the Mojave Desert area has no significant emission sources of its own, except mobile emissions along interstate highways. Air quality in the Mojave Desert area primarily depends on upwind emissions transported from the South Coast Air Basin, including Los Angeles. As a result of upwind emission controls, air quality of the Mojave Desert area has improved, but concentrations of ozone are still relatively high.

There are no ambient air-monitoring stations in Riverside County near the proposed Riverside East SEZ, except an ozone-monitoring station in Joshua Tree NP and Blythe. To characterize ambient air quality around the SEZ, two monitoring stations in the Coachella Valley of Riverside County were chosen: Indio, about 44 mi (71 km), and Palm Springs, about 62 mi (100 km) west of the SEZ. These monitoring stations, which are not in the Mojave Desert area but upwind of the SEZ along I-10, are considered representative of the proposed SEZ, although the Coachella Valley is designated as a nonattainment area for PM_{10}. Ambient concentrations of O_3, PM_{10}, and $PM_{2.5}$ are recorded at Indio, while those of NO_2, CO, O_3, PM_{10}, and $PM_{2.5}$ are recorded at Palm Springs. No SO_2 and Pb measurements are made either in the Mojave Desert area or in the Coachella Valley, so their measurements from Rubidoux are presented to demonstrate that these pollutants are not a concern in Riverside County. The background concentrations of criteria pollutants at these stations for the period 2004 to 2008 are presented in

TABLE 9.4.13.1-2 NAAQS, CAAQS, and Background Concentration Levels Representative of the Proposed Riverside East SEZ in Riverside County, California, 2004–2008

				Background Concentration Level	
Pollutant[a]	Averaging Time	NAAQS	CAAQS	Concentration[b,c]	Measurement Location, Year
SO_2	1-hour	0.075 ppm[d]	0.25 ppm	0.019 ppm (NA; 7.6%)	Rubidoux, 2005
	3-hour	0.5 ppm	NA[e]	0.015 ppm (3.0%; NA)	Rubidoux, 2004
	24-hour	0.14 ppm	0.04 ppm	0.015ppm (11%; 38%)	Rubidoux, 2004
	Annual	0.030 ppm	NA	0.004 ppm (13%; NA)	Rubidoux, 2005
NO_2	1-hour	0.100 ppm[f]	0.18 ppm	0.085 ppm (NA; 47%)	Palm Springs, 2006
	Annual	0.053 ppm	0.030 ppm	0.013 ppm (25%; 43%)	Palm Springs, 2004
CO	1-hour	35 ppm	20 ppm	2.0 ppm (5.7%; 10%)	Palm Springs, 2005
	8-hour	9 ppm	9.0 ppm	0.8 ppm (8.9%; 8.9%)	Palm Springs, 2006
O_3	1-hour	0.12 ppm[g]	0.09 ppm	0.098 ppm (NA; 109%)	Joshua Tree NP, 2008
	8-hour	0.075 ppm	0.070 ppm	0.084 ppm (112%; 120%)	Joshua Tree NP, 2008
PM_{10}	24-hour	150 $\mu g/m^3$	50 $\mu g/m^3$	157 $\mu g/m^3$ (105%; 314%)	Indio, 2007
	Annual	NA[h]	20 $\mu g/m^3$	56 $\mu g/m^3$ (NA; 280%)	Indio, 2007
$PM_{2.5}$	24-hour	35 $\mu g/m^3$	NA	26.8 $\mu g/m^3$ (77%; NA)	Indio, 2004
	Annual	15.0 $\mu g/m^3$	12 $\mu g/m^3$	10.8 $\mu g/m^3$ (72%; 90%)	Indio, 2004
Pb	30-day	NA	1.5 $\mu g/m^3$	NA	NA
	Calendar quarter	1.5 $\mu g/m^3$	NA	0.02 $\mu g/m^3$ (1.3%; NA)	Rubidoux, 2005
	Rolling 3-month	0.15 $\mu g/m^3$ [i]	NA	NA	NA

a Notation: CO = carbon monoxide; NO_2 = nitrogen dioxide; O_3 = ozone; Pb = lead; $PM_{2.5}$ = particulate matter with a diameter of ≤2.5 μm; PM_{10} = particulate matter with a diameter of ≤10 μm; and SO_2 = sulfur dioxide.

b Monitored concentrations are the highest for calendar-quarter Pb; second-highest for all averaging times less than or equal to 24-hour averages, except fourth-highest daily maximum for 8-hour O_3 and the 98th percentile for 24-hour $PM_{2.5;}$ and arithmetic mean for annual SO_2, NO_2, PM_{10}, and $PM_{2.5}$.

c Values in parentheses are background concentration levels as a percentage of NAAQS and CAAQS, respectively. Calculation of 1-hour SO_2, 1-hour NO_2, and rolling 3-month Pb to NAAQS was not made, because no measurement data based on new NAAQS are available.

d Effective August 23, 2010.

e NA = not applicable or not available.

f Effective April 12, 2010.

g The EPA revoked the 1-hour O_3 standard in all areas, although some areas have continuing obligations under that standard (“anti-backsliding”).

h Effective December 18, 2006, the EPA revoked the annual PM_{10} standard of 50 $\mu g/m^3$.

i Effective January 12, 2009.

Sources: CARB (2010b); EPA (2010a,b).

Table 9.4.13.1-2 (EPA 2010b). Monitored SO_2, NO_2, CO, and Pb levels were lower than their respective standards (up to 47%). Monitored O_3 and PM_{10} concentrations exceeded both NAAQS and CAAQS. Monitored $PM_{2.5}$ levels were lower than NAAQS and CAAQS but approaching CAAQS.

The PSD regulations (see 40 CFR 52.21), which are designed to limit the growth of air pollution in clean areas, apply to a major new source or modification of an existing major source within an attainment or unclassified area (see Section 4.11.2.3). As a matter of policy, the EPA recommends that the permitting authority notify Federal Land Managers when a proposed PSD source would locate within 62 mi (100 km) of a sensitive Class I area. There are several Class I areas around the Riverside East SEZ, only one of which is situated within 62 mi (100 km). The nearest Class I area is the Joshua Tree NP (40 CFR 81.405), adjacent to the Riverside East SEZ. The eastern portion of this Class I area is located downwind of prevailing winds at the Riverside East SEZ (Figure 9.4.13.1-1) and thus would be affected by activities at the proposed SEZ. The next nearest Class I areas are located beyond 62 mi (100 km), the San Jacinto WA and the San Gorgonio WA, which are about 66 mi (106 km) west and 73 mi (117 km) west-northwest of the Riverside East SEZ, respectively.

9.4.13.2 Impacts

Potential impacts on ambient air quality associated with a solar project would be of most concern during the construction phase. Impacts on ambient air quality from fugitive dust emissions resulting from soil disturbances are anticipated, but they would be of short duration. During the operations phase, only a few sources with generally low-level emissions would exist for any of the four types of solar technologies evaluated. A solar facility would either not burn fossil fuels or burn only small amounts during operation. (For facilities using heat transfer fluids [HTFs], fuel could be used to maintain the temperature of the HTFs for more efficient daily start-up.) Conversely, solar facilities would displace air emissions that would otherwise be released from fossil fuel–fired power plants.

Air quality impacts shared by all solar technologies are discussed in detail in Section 5.11.1, and technology-specific impacts are discussed in Section 5.11.2. Impacts specific to the proposed Riverside East SEZ are presented in the following sections. Any such impacts would be minimized through the implementation of required programmatic design features described in ,Appendix A, Section A.2.2, and through the application of any additional mitigation. Section 9.4.13.3, below, identifies SEZ-specific design features of particular relevance to the Riverside East SEZ.

9.4.13.2.1 Construction

The Riverside East SEZ has a relatively flat terrain; thus only a minimum number of site preparation activities, perhaps with no large-scale earthmoving operations, would be required. However, fugitive dust emissions from soil disturbances during the entire construction phase would be a major concern because of the large areas that would be disturbed in a region that experiences windblown dust problems. Fugitive dusts, which are released near ground level, typically have more localized impacts than similar emissions from an elevated stack, which has additional plume rise induced by buoyancy and momentum effects.

Methods and Assumptions

Air quality modeling for PM_{10} and $PM_{2.5}$ emissions associated with construction activities was performed by using the EPA-recommended AERMOD model (EPA 2009b). Details for emissions estimation, the description of AERMOD, input data processing procedures, and modeling assumption are described in Appendix M, Section M.13. Estimated air concentrations were compared with the applicable NAAQS/CAAQS levels at the site boundaries and nearby communities and with PSD increment levels at nearby Class I areas.[11] For the Riverside East SEZ, the modeling was conducted based on the following assumptions and input:

- Uniformly distributed emissions over the 3,000 acres (12.1 km^2) each and 9,000 acres (36.4 km^2) in total, and in the west-central portion of the SEZ, adjacent to the nearest Class I area (Joshua Tree NP) and north of many scattered residences, including Lake Tamarisk and Desert Center;

- Surface hourly meteorological data from the Blythe Airport and upper air sounding data from Desert Rock/Mercury, Nevada, for the 2005 to 2009 period;

- A regularly spaced receptor grid over a modeling domain of 62 × 62 mi (100 km × 100 km) centered on the proposed SEZ; and

- Additional discrete receptors at the SEZ boundaries and at the nearest Class I area—Joshua Tree NP—adjacent to the northwestern portion of the SEZ.

Results

The modeling results for both PM_{10} and $PM_{2.5}$ concentration increments and total concentrations (modeled plus background concentrations) that would result from construction-related fugitive emissions are summarized in Table 9.4.13.2-1. Maximum 24-hour PM_{10} concentration increments modeled to occur at the site boundaries would be an estimated 627 $\mu g/m^3$, which far exceeds the relevant NAAQS level of 150 $\mu g/m^3$ or the CAAQS level of 50 $\mu g/m^3$. Total 24-hour PM_{10} concentrations of 784 $\mu g/m^3$ would also exceed the NAAQS and CAAQS levels at the SEZ boundary. However, high PM_{10} concentrations would be limited to

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[11] To provide a quantitative assessment, the modeled air impacts of construction were compared to the NAAQS/CAAQS levels and the PSD Class I increment levels. Although the Clean Air Act exempts construction activities from PSD requirements, a comparison with the Class I increment levels was used to quantify potential impacts. Only monitored data can be used to determine the attainment status. Modeled data are used to assess potential problems and as a consideration in the permitting process.

TABLE 9.4.13.2-1 Maximum Air Quality Impacts from Emissions Associated with Construction Activities for the Proposed Riverside East SEZ

			Concentration (μg/m^3)				Percentage of NAAQS/CAAQS[e]	
Pollutant[a]	Averaging Time	Rank[b]	Maximum Increment[b]	Background[c]	Total	NAAQS/ CAAQS[d]	Increment	Total
PM_{10}	24-hour	H6H	627	157	784	150/50	418/1,255	523/1,569
	Annual	NA[f]	94.1	56.0	150	NA/20	NA/471	NA/751
$PM_{2.5}$	24-hour	H8H	44.2	26.8	71.0	35/NA	126/NA	203/NA
	Annual	NA	9.4	10.8	20.2	15.0/12	63/78	135/168

a $PM_{2.5}$ = particulate matter with a diameter of ≤2.5 μm; PM_{10} = particulate matter with a diameter of ≤10 μm.

b Concentrations for attainment demonstration are presented. H6H = highest of the sixth-highest concentrations at each receptor over the 5-year period. H8H = highest of the multiyear average of the eighth-highest concentrations at each receptor over the five-year period. For the annual average, multiyear averages of annual means over the five-year period are presented. Maximum concentrations are predicted to occur at the site boundaries.

c See Table 9.4.13.1-2.

d First and second values are NAAQS and CAAQS, respectively.

e First and second values are concentration levels as a percentage of NAAQS and CAAQS, respectively.

f NA = not applicable.

the immediate area surrounding the SEZ boundary and would decrease quickly with distance. Predicted maximum 24-hour PM_{10} concentration increments would be about 90 to 150 μg/m^3 at the nearest residences, scattered over the north of Lake Tamarisk; about 80 μg/m^3 at Lake Tamarisk; 40 μg/m^3 at Desert Center; 20 μg/m^3 at Eagle Mountain Pumping Station; and 10 μg/m^3 or less at residences around the eastern SEZ near Blythe. Concentration contours indicate that higher concentrations are limited to the boundary of Joshua Tree NP and from around the foot of higher elevations. Concentrations at higher elevations are relatively low (a maximum of about 20 μg/m^3). Annual average modeled PM_{10} concentration increments and total concentrations (increment plus background) at the SEZ boundary would be about 94.1 μg/m^3 and 150 μg/m^3, respectively, which are much higher than the CAAQS level of 20 μg/m^3. Annual PM_{10} increments would be much lower for the mentioned residences, about 2 to 10 μg/m^3 at the nearest residences, scattered over the north of Lake Tamarisk; about 2 μg/m^3 at Lake Tamarisk; and about 1 μg/m^3 at Desert Center and Eagle Mountain Pumping Station. Total 24-hour $PM_{2.5}$ concentrations would be 71 μg/m^3 at the SEZ boundary, which is much higher than the NAAQS level of 35 μg/m^3; the modeled increment contributes about twice as much as background concentrations to this total. The total annual average $PM_{2.5}$ concentration would be 20.2 μg/m^3, which is above the NAAQS and CAAQS levels of 15.0 and 12 μg/m^3, respectively. At the nearby residences, predicted maximum 24-hour and annual $PM_{2.5}$ concentration increments would be about 7.6 and 0.7 μg/m^3, respectively.

Predicted 24-hour and annual PM_{10} concentration increments at the nearest Class I Area, Joshua Tree NP, would be about 417 and 29.8 µg/m^3, or 5,200% and 746% of the PSD increments for Class I Areas, respectively.

In conclusion, predicted 24-hour and annual PM_{10} and $PM_{2.5}$ concentration levels could exceed NAAQS and CAAQS levels at the SEZ boundaries and in immediate surrounding areas during the construction of solar facilities. To reduce potential impacts on ambient air quality and to comply with BLM design features, aggressive dust control measures would be used. Potential air quality impacts on nearby residences and cities would be lower. Modeling indicates that construction activities could result in concentrations far above Class I PSD PM_{10} increments at the nearest federal Class I area (Joshua Tree NP). Construction activities are not subject to the PSD program and the comparison provides only a screen for gauging the size of the impact. Additionally, the assumed scenario—in which three construction projects would occur simultaneously near the western central portion of the SEZ—is quite conservative. If locations of construction were spread across the SEZ or the projects occurred at different times, potential impacts would be anticipated to be much lower than the aforementioned values. Accordingly, impacts of construction activities on ambient air quality would be expected to be moderate and temporary.

Construction emissions from the engine exhaust from heavy equipment and vehicles could cause impacts on AQRVs (e.g., visibility and acid deposition) at the adjacent federal Class I area, Joshua Tree NP, which is located downwind of prevailing winds, if construction were to occur in the western portion of the SEZ. SO_x emissions from engine exhaust would be very low, because BLM design features would require that ultra-low-sulfur fuel with a sulfur content of 15 ppm be used. NO_x emissions from engine exhaust would be primary contributors to potential impacts on AQRVs. Construction-related emissions are temporary in nature and thus would cause some unavoidable but short-term impacts.

For this analysis, the impacts of construction and operation of transmission lines outside of the SEZ were not assessed, assuming that one or more of the existing transmission lines (ranging from 69 kV to 500 kV) located within the SEZ might be used to connect some new solar facilities to load centers, and that additional project-specific analysis would be done for new transmission construction or line upgrades. However, some construction of transmission lines could occur within the SEZ. Potential impacts on ambient air quality would be a minor component of construction impacts in comparison with solar facility construction and would be temporary in nature.

9.4.13.2.2 Operations

Emission sources associated with the operation of a solar facility would include auxiliary boilers; vehicle (commuter, visitor, support, and delivery) traffic; maintenance (e.g., mirror cleaning and repair and replacement of damaged mirrors); and drift from cooling towers for the parabolic trough or power tower technologies if wet cooling was implemented (drift consists of low-level PM emissions).

The type of emission sources caused by and offset by operation of a solar facility are discussed in Appendix M, Section M.13.4.

Estimates of potential air emissions displaced by the solar project development at the Riverside East SEZ are presented in Table 9.4.13.2-2. Total power generation capacity ranging from 18,035 to 32,463 MW is estimated for the Riverside East SEZ for various solar technologies (see Section 9.4.2). The estimated amount of emissions avoided for the solar technologies evaluated depends only on the megawatts of conventional fossil fuel–generated power displaced, because a composite emission factor per megawatt-hour of power by conventional technologies is assumed (EPA 2009c). If the Riverside East SEZ were fully developed, emissions avoided would be expected to be substantial. Development of solar power in the SEZ would result in avoided air emissions ranging from 30% to 54% of total emissions of SO_2, NO_X, Hg, and CO_2 from electric power systems in the state of California (EPA 2009c).

TABLE 9.4.13.2-2 Annual Emissions from Combustion-Related Power Generation Displaced by Full Solar Development of the Proposed Riverside East SEZ

Area Size (acres)	Capacity (MW)[a]	Power Generation (GWh/yr)[b]	Emissions Displaced (tons/yr; 10^3 tons/yr for CO_2)[c]			
			SO_2	NO_x	Hg	CO_2
202,896	18,035–32,463	31,598–56,876	4,040–7,272 (23,867–42,961)	6,636–11,944 (35,174–63,313)	0.06–0.11 (0.28–0.50)	15,699–28,258 (24,932–44,878)
Percentage of total emissions from electric power systems in California[d]			30–54%	30–54%	30–54%	30–54%
Percentage of total emissions from all source categories in California[e]			5.7–10%	0.55–1.0%	NA[f]	3.6–6.6%
Percentage of total emissions from electric power systems in the six-state study area[d]			1.6–2.9% (9.5–17%)	1.8–3.2% (9.5–17%)	2.0–3.6 (9.5–17%)	6.0–11% (9.5–17%)
Percentage of total emissions from all source categories in the six-state study area[e]			0.86–1.5% (5.1–9.1%)	0.25–0.44% (1.3–2.3%)	NA (NA)	1.9–3.4% (3.0–5.4%)

a It is assumed that the SEZ would eventually have development on 80% of the lands and that a range of 5 acres (0.020 km^2) per MW (for parabolic trough technology) to 9 acres (0.036 km^2) per MW (power tower, dish engine, and PV technologies) would be required.

b Assumed a capacity factor of 20%.

c Composite combustion-related emission factors for SO_2, NO_x, Hg, and CO_2 of 0.26, 0.42, 3.7×10^{-6}, and 994 lb/MWh, respectively, were used for the state of California. Values in parentheses are estimated based on composite combustion-related emission factors for SO_2, NO_x, Hg, and CO_2 of 1.51, 2.23, 1.8×10^{-5}, and 1,578 lb/MWh, respectively, averaged over six southwestern states.

d Emission data for all air pollutants are for 2005.

e Emission data for SO_2 and NO_x are for 2002, while those for CO_2 are for 2005.

f NA = not estimated.

Sources: EPA (2009a,c); WRAP (2009).

Avoided emissions would be up to 11% of total emissions from electric power systems in the six-state study area. When compared with all source categories, power production from the same solar facilities would displace up to 10% of SO_2, 1.0% of NO_x, and 6.6% of CO_2 emissions in the state of California (EPA 2009a; WRAP 2009). These emissions would be up to 3.4% of total emissions from all source categories in the six-state study area. Power generation from fossil fuel–fired power plants accounts for only 53% of the total electric power generation in California, most of which is from natural gas combustion. Thus, solar facilities to be built in the Riverside East SEZ could considerably reduce fuel combustion-related emissions in California but relatively less so than those built in other states with higher fossil use rates.

About one-quarter of electricity consumed in California is generated out of state, with about three-quarters of this amount coming from the southwestern states. Thus, it is possible that a solar facility in California would replace power from fossil fuel–fired power plants outside of California but within the six-state study area. It is also possible that electric power transfer between the states will increase in the future. To assess potential region-wide emissions benefit, emissions being displaced were also estimated based on composite emission factors averaged over the six-state study area. For SO_2, NO_x, and Hg, composite emission factors for the six-state study area would be about 5 to 6 times higher than those for California alone. For CO_2, the six-state emission factor is about 60% higher than the California-only emission factor. If the Riverside East SEZ were fully developed, emissions avoided would be considerable. Development of solar power in the SEZ would result in avoided air emissions ranging from 9.5% to 17% of total emissions of SO_2, NO_x, Hg, and CO_2 from electric power systems in the six southwestern states. These emissions would be up to 9.1% of total emissions from all source categories in the six-state study area.

As discussed in Section 5.11.1.5, the operation of associated transmission lines would generate some air pollutants from activities such as periodic site inspections and maintenance. However, these activities would occur infrequently, and the amount of emissions would be small. In addition, transmission lines could produce minute amounts of O_3 and its precursor NO_x associated with corona discharge (i.e., the breakdown of air near high-voltage conductors), which is most noticeable for higher-voltage lines during rain or very humid conditions. Since the Riverside East SEZ is located in an arid desert environment, these emissions would be small, and potential impacts on ambient air quality would be negligible, considering the infrequent occurrences and small amount of emissions from corona discharges.

9.4.13.2.3 Decommissioning/Reclamation

As discussed in Section 5.11.1.4, decommissioning/reclamation activities are similar to construction activities but on a more limited scale and of shorter duration. Potential impacts on ambient air quality would be correspondingly less than those from construction activities. Decommissioning activities would last for a short period, and their potential impacts would be moderate and temporary. The same mitigation measures adopted during the construction phase would be implemented during the decommissioning phase (Section 5.11.3).

9.4.13.3 SEZ-Specific Mitigation Measures and Mitigation Effectiveness

No SEZ-specific design features are required. Limiting dust generation during construction and operations at the proposed Riverside East SEZ (such as increased watering frequency or road paving or treatment) is a required design feature under BLM's proposed Solar Energy Program. These extensive fugitive dust control measures would keep off-site PM levels as low as possible during construction.

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9.4.14 Visual Resources

9.4.14.1 Affected Environment

The proposed Riverside East SEZ is located in the Chuckwalla Valley and the southern portion of the Palen Valley approximately 6.7 mi (10.9 km) west of the California–Arizona border within the CDCA in Riverside County in southern California. The SEZ lies within the Mojave basin and range physiographic province, typified by small, rocky mountain ranges with jagged peaks alternating with talus slopes and desert floor. Flat basins form broad flat expanses of barren plains, generally with low scrub vegetation and expansive views. Dark browns and garnets are the dominant mountain hues, although blues and purples prevail as viewing distance increases. In contrast, lighter brown and tan soils dominate the desert floor, sparsely dotted with the grey-green of Sonoran creosotebush and golden bursage scrub vegetation (BLM and CEC 2010a).

The SEZ includes portions of both the Sonoran Basin and Range ecoregion and the western portion of the Mojave Basin and Range ecoregion (EPA 2007) and is located within two of the USFS's ecological subsections: Chuckwalla Valley and Palo Verde Valley and Mesa. Both are characterized by very gently to moderately sloping alluvial fans, with nearly level basin floors (USFS 1997).

Within the Chuckwalla Valley, elevations range from 350 ft (106.7 m) at Ford Dry Lake to about 800 ft (243.8 m). The small surrounding mountain ranges rise 3,000 to 5,000 ft (914.4 to 1,524 m) above mean sea level. Visually prominent mountain ranges around the valley include the Big Maria Mountains to the east; the Little Maria, Palen, and McCoy ranges to the north; the Coxcomb Mountains within Joshua Tree NP to the northwest; the Eagle Mountains to the west, the majority of which are within Joshua Tree NP; the Chuckwalla and Little Chuckwalla Mountains to the south; and the Mule and Palo Verde Mountains to the southeast. The SEZ and surrounding mountain ranges are shown in Figure 9.4.14.1-1.

The Riverside East SEZ (202,896 acres [821 km^2]) occupies an area approximately 46 mi (74 km) east to west (at greatest extent) and 27 mi (43 km) north to south (at greatest extent), and is located approximately 8.4 mi (13.5 km) (at closest approach) west of the town of Blythe and 47 mi (76 km) east of the community of Indio. The community of Desert Center is located adjacent to the southwest corner of the SEZ. I-10 runs through the eastern portion of the SEZ and then along most of its southern border. There are a number of exits to local roads off I-10 as it passes by and through the SEZ. State Route 177 passes through the west side of the SEZ in a northeasterly direction, and the Midland-Rice Road and a railroad pass through the eastern portion of the SEZ in a northwesterly direction.

The SEZ is located within the flat plains of the Chuckwalla and Palen Valley floors, and the strong horizon line and the above-mentioned mountain ranges surrounding the valley are the dominant visual features. Elevation within the SEZ ranges from a low of 250 ft (76 m) on the southeastern border of the SEZ near Blythe to a high of 1,690 ft (516 m) on the northeastern border of the SEZ in the Big Maria Mountains; however, the valley floor ranges from

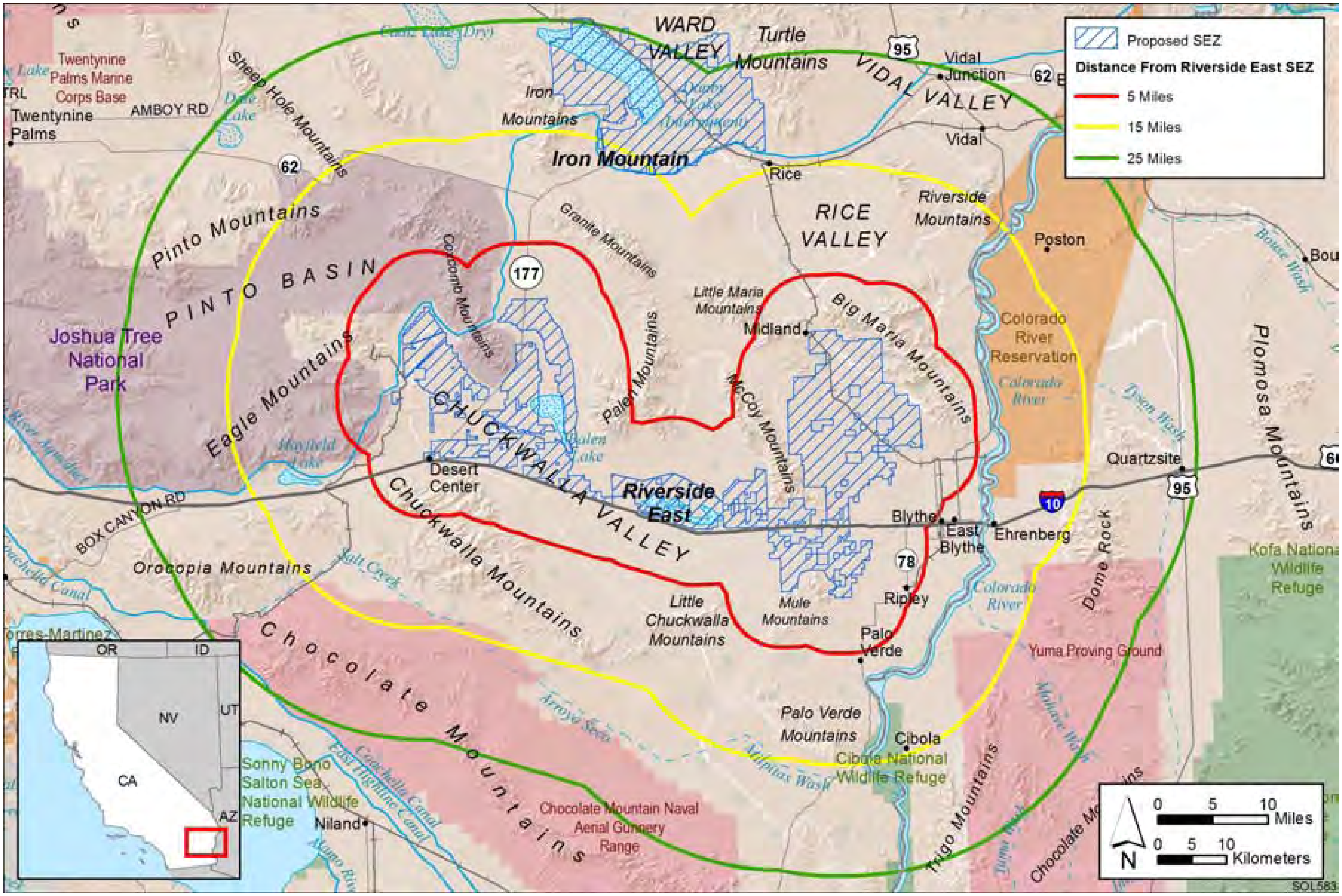

FIGURE 9.4.14.1-1 Proposed Riverside East SEZ and Surrounding Lands

approximately 360 to 750 ft (110 to 230 m). The western portion generally slopes gently southward to a low point at Ford Dry Lake, while the eastern portion of the SEZ slopes southeastward toward the Colorado River. The flatness of the valley and general absence of screening vegetation afford panoramic views of the vast valley floor and the surrounding mountain ranges that form a visual backdrop.

The Chuckwalla Valley is located within the ecotone between the Mojave and Sonoran Deserts; thus the SEZ, although very flat, is vegetatively diverse. While much of the area is dominated by creosote shrublands or areas with very little vegetation, the eastern portion of the SEZ, especially along McCoy Wash and its tributaries, contains a well-developed ironwood/palo verde community.

Much of the SEZ consists of flats with widely spaced, olive green creosote bushes and other low shrubs of various green and brown hues, but there are also dry lake beds, sandy areas, and dry washes with ironwood and other trees. The diverse landscape types result in somewhat varied colors and textures, although foreground textures are generally coarse. Soils are generally very light tan and visually prominent over most of SEZ due to the sparse vegetation. Other portions of the SEZ contain generally light gray gravel flats. Some areas are devoid or nearly devoid of vegetation.

No permanent water features are present on the SEZ. This landscape type is common within the region.

Although the SEZ itself is generally natural appearing, cultural modifications within the SEZ detract somewhat from the SEZ's scenic quality. In addition to I-10, State Route 177, and Midland Road, several gravel and dirt roads of various sizes cross the SEZ. Transmission lines also cross the SEZ. An apparently abandoned railroad runs through the eastern portion of the SEZ. The Midland Long Term Visitor Area is also located on the east side of the SEZ. An existing 500-kV transmission line runs east–west along I-10 and parallel to the southern SEZ boundary. In addition, a 230-kV line passes through the far western section of the SEZ, and a 69-kV line passes through the eastern portion of the SEZ, along with other transmission lines (see Section 9.4.2).

Off-site views are dominated by the surrounding mountain ranges, which, in some cases, for example, the Coxcomb, McCoy, Big Maria, Little Maria, and Mule Mountains, rise from the valley floor immediately adjacent to the SEZ. Other ranges, such as the Eagle, Chuckwalla, Little Chuckwalla, and Palen Mountains, are separated from the SEZs by one to several miles of bajadas or valley floor. The mountain slopes and peaks around the SEZ are, in general, visually pristine, as they are largely within congressionally designated WAs.

The general lack of topographic relief, water, and variety results in low scenic quality on the valley floor; however, because of the flatness of the landscape, the lack of trees, and the breadth of the Chuckwalla Valley, the SEZ presents a vast panoramic landscape with sweeping views of the surrounding mountains that add significantly to the scenic quality of the SEZ. In general, the mountains appear to be devoid of vegetation, and their generally jagged, irregular form and brown/garnet colors provide dramatic visual contrasts to the strong horizontal line, green vegetation, and light-colored soils of the valley floor, particularly when viewed from nearby locations within the SEZ. Panoramic views of the SEZ are shown in Figures 9.4.14.1-2, 9.4.14.1-3, and 9.4.14.1-4.

Off-site cultural modifications near the SEZ detract somewhat from the SEZ's scenic quality. The abandoned Eagle Mountain Mine is prominently visible in the Eagle Mountains from the far northwest portion of the SEZ. Near the western boundary of the SEZ are several small, private lots and homes, including a housing development at Lake Tamarisk, immediately adjacent to the farthest southwest portion of the SEZ. Ironwood State Prison is visible from nearby locations within the far southeastern portion of the SEZ. Traffic on I-10 adjacent to or near the SEZ is visible from the southern portions of the SEZ.

While the lands to the north and west of the SEZ are generally undeveloped mountains, the lands to the southeast are agricultural, and there is development visible along I-10 just south of the SEZ, though areas south of the SEZ beyond I-10 are generally undeveloped. Aside from agriculture and development in the I-10 corridor, off-site views from the SEZ include isolated ranches, homes, and associated structures located on private lands near the SEZ, as well as local roads and airstrips. Scattered tanks and other structures associated with ranching and farming are also visible.

While these cultural modifications within and around the SEZ generally detract from the scenic quality of the SEZ, the SEZ is so large that from many locations within it, these features are either not visible or so distant as to have minimal effect on views. In addition, most of the cultural disturbances are found in or near the southern and far western portions of the SEZ. From most locations within the SEZ, particularly in the northern and eastern portions of the SEZ, the landscape is generally natural in appearance, with little disturbance apparent.

The BLM conducted a Visual Resource Inventory (VRI) for the SEZ and surrounding lands in 2010 (BLM 2010e). The VRI evaluates BLM-administered lands based on *scenic quality*; *sensitivity level,* in terms of public concern for preservation of scenic values in the evaluated lands; and *distance* from travel routes or key observation points. Based on these three factors, BLM-administered lands are placed into one of four Visual Resource Inventory Classes, which represent the relative value of the visual resources. Class I and II are the most valued; Class III represents a moderate value; and Class IV represents the least value. Class I is reserved for specially designated areas, such as national wildernesses and other congressionally and administratively designated areas where decisions have been made to preserve a natural landscape. Class II is the highest rating for lands without special designation. More information about VRI methodology is available in Section 5.7 and in *Visual Resource Inventory*, BLM Manual Handbook 8410-1 (BLM 1986a).

The VRI map for the SEZ and surrounding lands is shown in Figure 9.4.14.1-5. The VRI classes for the SEZ are VRI Class II, indicating high relative visual values; Class III, indicating moderate relative visual values; and Class IV, indicating low relative visual values. Within the SEZ, VRI Class II areas include lands within 5 mi (8 km) of Joshua Tree NP in the northwestern portion of the SEZ, and lands in the southeastern portion of the SEZ between the Palen Mountains and the Little Chuckwalla Mountains. The inventory indicates moderate scenic

FIGURE 9.4.14.1-2 Approximately 120° Panoramic View of Western Portion of the Proposed Riverside East SEZ from Desert Center Facing Northeast, Including Lake Tamarisk (foreground) and Coxcomb Mountains in Joshua Tree NP (background center)

FIGURE 9.4.14.1-3 Approximately 180° Panoramic View of the Proposed Riverside East SEZ from I-10 near Ford Dry Lake Facing North, Including Chuckwalla Mountains (far left), Palen Mountains (background center), and McCoy Mountains (right)

FIGURE 9.4.14.1-4 Approximately 120° Panoramic View of the Northeastern Portion of the Proposed Riverside East SEZ from McCoy Wash Facing Northeast, Including Big Maria Mountains

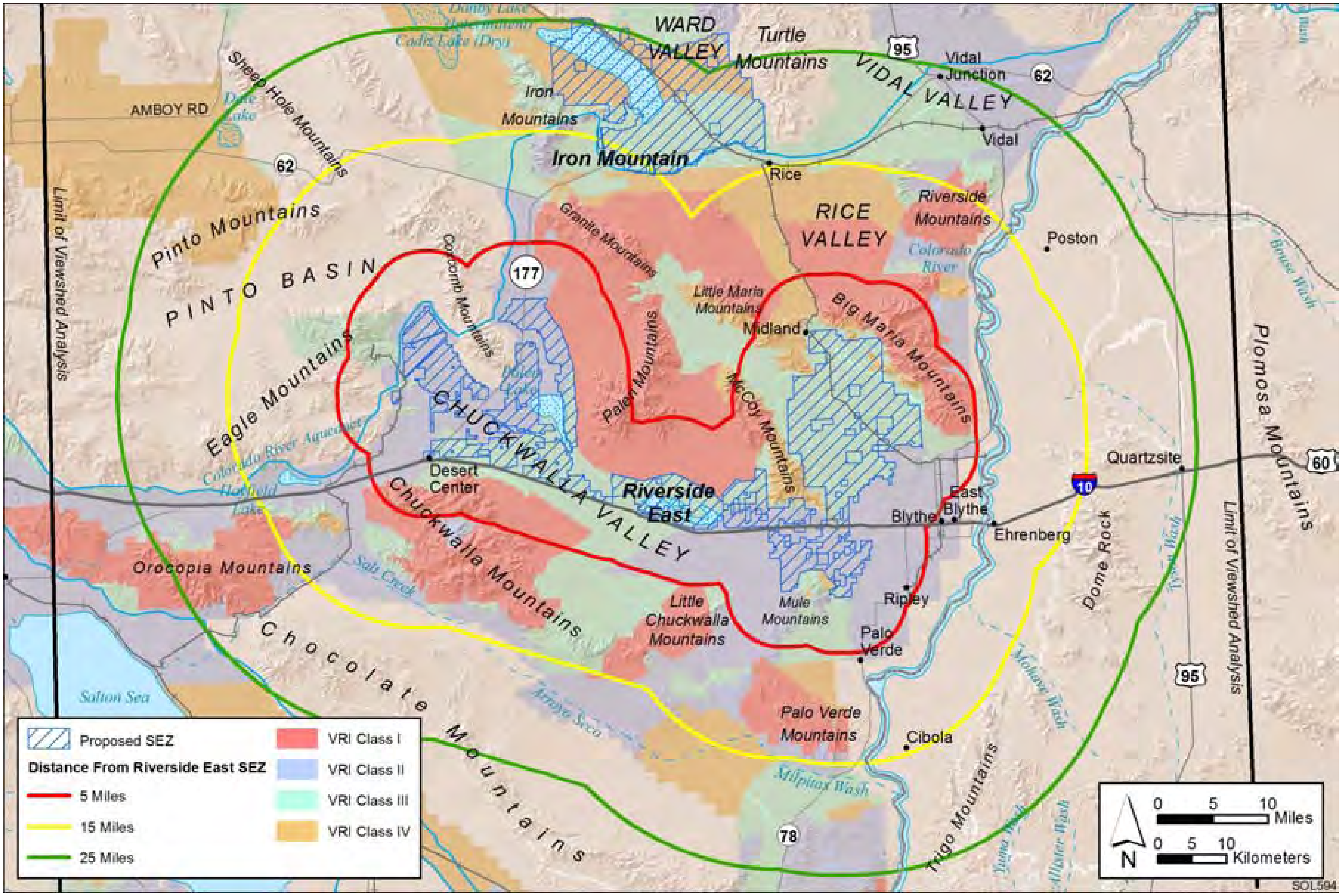

FIGURE 9.4.14.1-5 Visual Resource Inventory Values for the Proposed Riverside East SEZ and Surrounding Lands

quality for the Chuckwalla Valley. The scenic quality rating includes a high score for attractive off-site views and low scores for landform variety and the presence of water. The inventory indicates high sensitivity for the SEZ lands near Joshua Tree NP, noting a high level of public concern for the heavily visited NP. The inventory indicates high sensitivity for the Class II area in the southeastern portion of the SEZ, based on heavy recreational use, the presence of a BLM Backcountry Byway (the Bradshaw Trail) and historic trails, and close proximity to congressionally designated wilderness and ACECs. Both areas were designated as foreground–middleground distance zones, based on proximity to major or secondary travel routes.

VRI Class III lands include the central portion of the Chuckwalla Valley within the west–central, southern, and northeastern parts of the SEZ. These lands received lower sensitivity ratings than the Class II areas, primarily because they are farther from Joshua Tree NP and other high-value scenic resource areas. They received moderate scores for sensitivity, in part because of high visibility from I-10, their inclusion in the CDCA, and their proximity to the NP and other WAs. VRI Class IV lands include very small areas on the edges of the northeastern part of the SEZ, corresponding to areas where mining damage in the McCoy and Big Maria Mountains is visible.

In the Barstow, El Centro, Needles, and Palm Springs-South Coast FOs, lands within the 25-mi (40-km), 650-ft (198-m) viewshed of the SEZ contain 318,419 acres (1,288.60 km^2) of VRI Class I areas in Palen-McCoy WA and other special designation lands; 390,052 acres (1,578.48 km^2) of VRI Class II areas, primarily west, southwest, and southeast of the SEZ; 429,146 acres (1,736.69 km^2) of Class III areas, primarily in the Chuckwalla Valley north and south of the SEZ; and 176,428 acres (713.98 km^2) of VRI Class IV areas, concentrated primarily in heavily mined mountain ranges and the floors of valleys adjacent to Chuckwalla Valley, including Rice and Ward Valleys.

BLM has not assigned VRM classes to the SEZ and surrounding lands. More information about the BLM VRM program is available in Section 5.12 and in *Visual Resource Management*, BLM Manual Handbook 8400 (BLM 1984).

9.4.14.2 Impacts

The potential for impacts from utility-scale solar energy facilities on visual resources within the proposed Riverside East SEZ and surrounding lands, as well as the impacts of related projects (e.g., access roads and transmission lines) outside of the SEZ, is presented in this section.

Site-specific impact assessment is needed to systematically and thoroughly assess visual impact levels for a particular project. Without precise information about the location of a project and a relatively complete and accurate description of its major components and their layout, it is not possible to assess precisely the visual impacts associated with the facility. However, if the general nature and location of a facility are known, a more generalized assessment of potential visual impacts can be made by describing the range of expected visual changes and discussing contrasts typically associated with these changes. In addition, a general analysis can be used to identify sensitive resources that may be at risk if a future project is sited in a particular area. Detailed information about the methodology employed for the visual impact assessment for this PEIS, including assumptions and limitations, is presented in Appendix M.

Potential Glint and Glare Impacts. Similarly, the nature and magnitude of potential glint- and glare-related visual impacts for a given solar facility are highly dependent on viewer position, sun angle, the nature of the reflective surface and its orientation relative to the sun and the viewer, atmospheric conditions, and other variables. The determination of potential impacts from glint and glare from solar facilities within a given proposed SEZ would require precise knowledge of these variables and is not possible given the scope of this PEIS. Therefore, the following analysis does not describe or suggest potential contrast levels arising from glint and glare for facilities that might be developed within the SEZ; however, it should be assumed that glint and glare are possible visual impacts from *any* utility-scale solar facility, regardless of size, landscape setting, or technology type. The occurrence of glint and glare at solar facilities could potentially cause large though temporary increases in brightness and visibility of the facilities. The visual contrast levels projected for sensitive visual resource areas discussed in the following analysis do not account for potential glint and glare effects; however, these effects would be incorporated into a future site- and project-specific assessment that would be conducted for specific proposed utility-scale solar energy projects. For more information about potential glint and glare impacts associated with utility-scale solar energy facilities, see Section 5.12 of this PEIS.

9.4.14.2.1 Impacts on the Proposed Riverside East SEZ

Some or all of the SEZ could be developed for one or more utility-scale solar energy projects, utilizing one or more of the solar energy technologies described in Appendix F. Because of the industrial nature and large size of utility-scale solar energy facilities, large visual impacts on the SEZ would occur as a result of the construction, operation, and decommissioning of solar energy projects. In addition, large impacts could occur at solar facilities utilizing highly reflective surfaces or major light-emitting facility components (solar dish, parabolic trough, and power tower technologies), with lesser impacts associated with reflective surfaces expected from PV facilities. These impacts would be expected to involve major modification of the existing character of the landscape and would likely dominate the views from nearby locations. Additional, and potentially large impacts would occur as a result of the construction, operation, and decommissioning of related facilities, such as access roads and electric transmission lines within the SEZ (however, no new transmission line construction outside of the proposed SEZ was assessed; see Section 9.4.1.2). While the primary visual impacts associated with solar energy development within the SEZ would occur during daylight hours, lighting required for utility-scale solar energy facilities would be a potential source of visual impacts at night, both within the SEZ and on surrounding lands.

Common and technology-specific visual impacts from utility-scale solar energy development, as well as impacts associated with electric transmission lines, are discussed in Section 5.12 of this PEIS. Impacts would last throughout construction, operation, and decommissioning, and some impacts could continue after project decommissioning. Visual impacts resulting from solar energy development in the SEZ would be in addition to impacts from solar energy development and other development that may occur on other public or private lands within the SEZ viewshed and are subject to cumulative effects. For discussion of cumulative impacts, see Section 9.4.22.4.13 of the PEIS.

The changes described above would be expected to be consistent with BLM VRM objectives for VRM Class IV, as seen from nearby KOPs. The BLM has not assigned VRM classes to the SEZ and surrounding lands. More information about impact determination using the BLM VRM program is available in Section 5.12 and in *Visual Resource Contrast Rating*, BLM Manual Handbook 8431-1 (BLM 1986b).

Implementation of the programmatic design features intended to reduce visual impacts (described in Appendix A, Section A.2.2) would be expected to reduce visual impacts associated with utility-scale solar energy development within the SEZ; however, the degree of effectiveness of these design features could be assessed only at the site- and project-specific level. Given the large scale, reflective surfaces, and strong regular geometry of utility-scale solar energy facilities and the lack of screening vegetation and landforms within the SEZ viewshed, siting the facilities away from sensitive visual resource areas and other sensitive viewing areas would be the primary means of mitigating visual impacts. The effectiveness of other visual impact mitigation measures would generally be limited, but would be important to reduce visual contrasts to the greatest extent possible.

9.4.14.2.2 Impacts on Lands Surrounding the Proposed Riverside East SEZ

Impacts on Selected Sensitive Visual Resource Areas

Because of the large size of utility-scale solar energy facilities and the generally flat, open nature of the proposed SEZ, lands outside the SEZ would be subjected to visual impacts related to construction, operation, and decommissioning of utility-scale solar energy facilities. The affected areas and extent of impacts would depend on a number of visibility factors and viewer distance (for a detailed discussion of visibility and related factors, see Section 5.12). A key component in determining impact levels is the intervisibility between the project and potentially affected lands; if topography, vegetation, or structures screen the project from viewer locations, there is no impact.

Preliminary viewshed analyses were conducted to identify which lands surrounding the proposed SEZ could have views of solar facilities in at least some portion of the SEZ (see Appendix M for important information on assumptions and limitations of the methods used). Four viewshed analyses were run, assuming four different heights representative of project elements associated with potential solar energy technologies: 24.6 ft (7.5 m) for PV and parabolic trough arrays; 38 ft (11.6 m) for solar dishes and power blocks for CSP technologies; 150 ft (45.7 m) for transmission towers and short solar power towers; and 650 ft (198.1 m) for tall solar power towers. Viewshed maps for the SEZ for all four solar technology heights are available in Appendix N.

Because of the large size of the SEZ, the area's topography, and the general lack of screening vegetation, the viewshed of the SEZ is enormous. Within 25 mi (41 km) of the SEZ, 650-ft (198-m) power towers within the SEZ could theoretically be visible within an area of more than 2,100,000 acres (8,500 km^2), which is more than twice the land area of the state of Rhode Island. The viewshed includes large portions of the mountain ranges surrounding the Chuckwalla Valley and some neighboring valleys, including Ward and Rice Valleys, and the Pinto Basin. Because the lands surrounding the SEZ contain a number of sensitive visual resource areas, these areas could be subject to visual impacts associated with solar energy development within the SEZ.

Figure 9.4.14.2-1 shows the combined results of the viewshed analyses for all four solar technologies. The colored portions indicate areas with clear lines of sight to one or more areas within the SEZ and from which solar facilities within these areas of the SEZ would be expected to be visible, assuming the absence of screening vegetation or structures and adequate lighting and other atmospheric conditions. The light brown areas are locations from which PV and parabolic trough arrays located in the SEZ could be visible. Solar dishes and power blocks for CSP technologies would be visible from the areas shaded in light brown and the additional areas shaded in light purple. Transmission towers and short solar power towers would be visible from the areas shaded light brown, light purple, and the additional areas shaded in dark purple. Power tower facilities located in the SEZ could be visible from areas shaded light brown, light purple, dark purple, and at least the upper portions of power tower receivers could be visible from the additional areas shaded in medium brown.

For the following visual impact discussion, the tall solar power tower (650 ft [198.1 m]) and PV and parabolic trough array (24.6 ft [7.5 m]) viewsheds are shown in figures and discussed in the text. These heights represent the maximum and minimum landscape visibility for solar energy technologies analyzed in this PEIS. Viewsheds for solar dish and CSP technology power blocks (38 ft [11.6 m]) and for transmission towers and short solar power towers (150 ft [45.7 m]) are presented in Appendix N. The visibility of these facilities would fall between that for tall power towers and PV and parabolic trough arrays.

Impacts on Selected Federal-, State-, and BLM-Designated Sensitive Visual Resource Areas

Figure 9.4.14.2-2 shows the results of a GIS analysis that overlays selected federal-, state-, and BLM-designated sensitive visual resource areas onto the combined tall solar power tower (650 ft [198.1 m]) and PV and parabolic trough array (24.6 ft [7.5 m]) viewsheds, in order to illustrate which of these sensitive visual resource areas could have views of solar facilities within the SEZ and therefore potentially would be subject to visual impacts from those facilities. Distance zones that correspond with BLM's VRM system-specified foreground–middleground distance (5 mi [8 km]), background distance (15 mi [24.1 km]), and a 25-mi (40.2-km) distance zone are shown as well, in order to indicate the effect of distance from the SEZ on impact levels, which are highly dependent on distance.

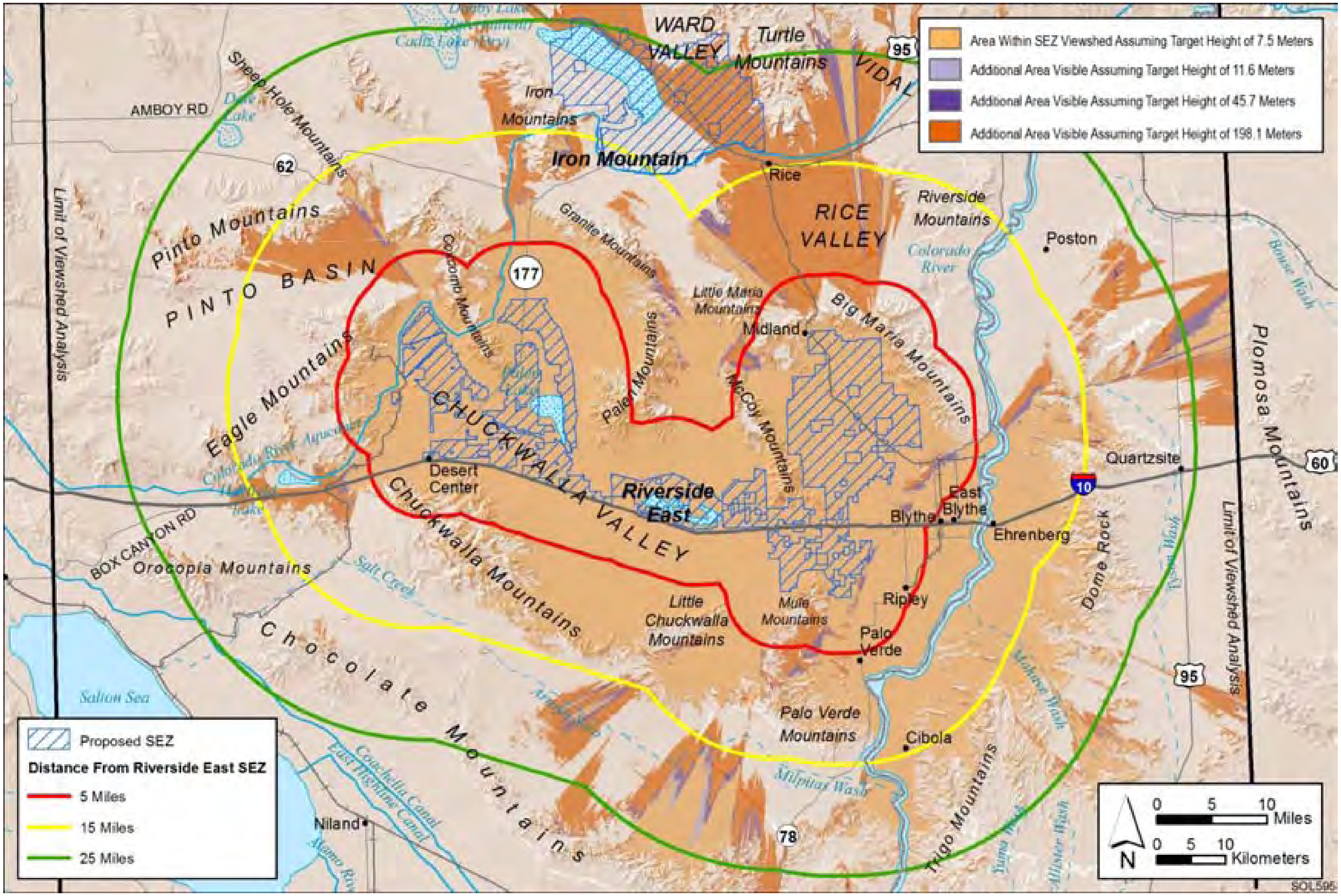

FIGURE 9.4.14.2-1 Viewshed Analyses for the Proposed Riverside East SEZ and Surrounding Lands, Assuming Solar Technology Heights of 24.6 ft (7.5 m), 38 ft (11.6 m), 150 ft (45.7 m), and 650 ft (198.1 m) (shaded areas indicate lands from which solar development within the SEZ could be visible)

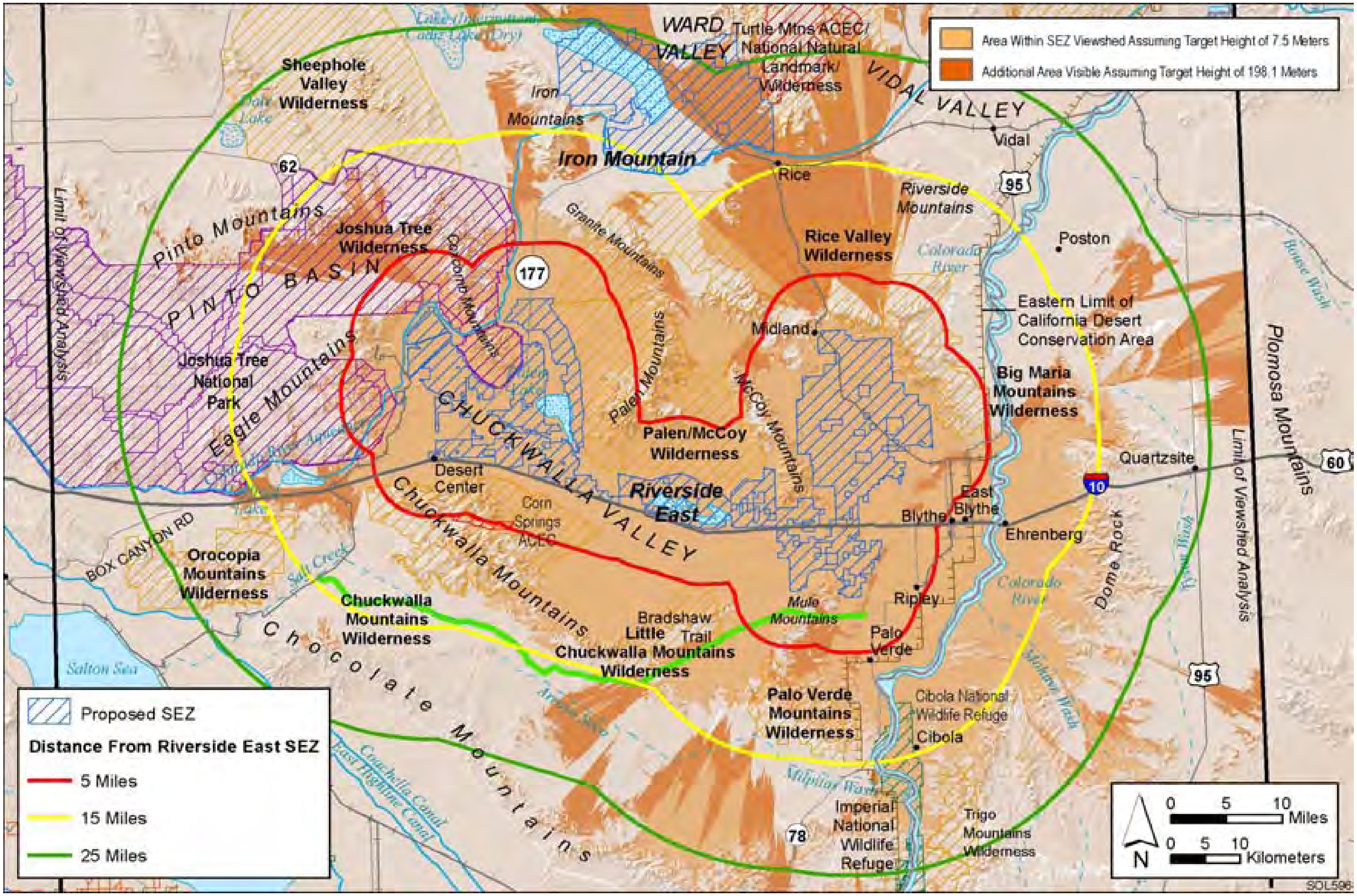

FIGURE 9.4.14.2-2 Overlay of Selected Sensitive Visual Resource Areas onto Combined 650-ft (198.1-m) and 24.6-ft (7.5-m) Viewsheds for the Proposed Riverside East SEZ

The scenic resources included in the analysis were as follows:

- National Parks, National Monuments, National Recreation Areas, National Preserves, National Wildlife Refuges, National Reserves, National Conservation Areas, National Historic Sites;

- Congressionally authorized Wilderness Areas;

- Wilderness Study Areas;

- National Wild and Scenic Rivers;

- Congressionally authorized Wild and Scenic Study Rivers;

- National Scenic Trails and National Historic Trails;

- National Historic Landmarks and National Natural Landmarks;

- All-American Roads, National Scenic Byways, State Scenic highways, and BLM- and USFS-designated scenic highways/byways; BLM-designated Special Recreation Management Areas; and

- ACECs designated because of outstanding scenic qualities.

Potential impacts on specific sensitive resource areas visible from and within 25 mi (40 km) of the proposed Riverside East SEZ are discussed below. The results of this analysis are also summarized in Table 9.4.14.2-1. Further discussion of impacts on these areas is available in Sections 9.4.3 (Specially Designated Areas and Lands with Wilderness Characteristics) and 9.4.17 (Cultural Resources) of this PEIS.

The following visual impact analysis describes *visual contrast levels* rather than *visual impact levels*. *Visual contrasts* are changes in the landscape as seen by viewers, including changes in the forms, lines, colors, and textures of objects seen in the landscape. A measure of *visual impact* includes potential human reactions to the visual contrasts arising from a development activity, based on viewer characteristics, including attitudes and values, expectations, and other characteristics that that are viewer- and situation-specific. Accurate assessment of visual impacts requires knowledge of the potential types and numbers of viewers for a given development and their characteristics and expectations; specific locations where the project might be viewed from; and other variables that were not available or not feasible to incorporate in this PEIS analysis. These variables would be incorporated into a future site- and project-specific assessment that would be conducted for specific proposed utility-scale solar energy projects. For more discussion of visual contrasts and impacts, see Section 5.12 of the PEIS.

TABLE 9.4.14.2-1 Selected Potentially Affected Sensitive Visual Resources within a 25-mi (40.2-km) Viewshed of the Proposed Riverside East SEZ, Assuming a Viewshed Analysis Target Height of 650 ft (198.1 m)

		Feature Area or Linear Distance[a]		
			Visible between	
Feature Type	Feature Name (Total Acreage)	Visible within 5 mi	5 and 15 mi	15 and 25 mi
National Conservation Area	California Desert (25,919,319 acres)	763,254 acres (3%)[b]	479,968 acres (2%)	251,330 acres (1%)
NPs	Joshua Tree (793,331 acres)	53,426 acres (7%)	57,990 acres (7%)	6,175 acres (0.8%)
Scenic Highway	Bradshaw Trail	9 mi (15 km)	14 mi (23 km)	0 acres
WAs	Big Maria Mountains (46,056 acres)	8,873 acres (19%)	0 acres	0 acres
	Chuckwalla Mountains (88,202 acres)	31,482 acres (36%)	18,470 acres (21%)	0 acres
	Imperial Refuge (15,714 acres)	0 acres	0 acres	560 acres (4%)
	Joshua Tree (586,623 acres)	40,421 acres (7%)	55,696 acres (9%)	3,343 acres (0.5%)
	Little Chuckwalla Mountains (28,708 acres)	76 (0.3%)	16,603 acres (58%)	0 acres
	Orocopia Mountains (54,709 acres)	0 acres	143 acres (0.3%)	2,108 acres (4%)
	Palen-McCoy (224,414 acres)	95,559 acres (43%)	75,107 acres (33%)	0 acres
	Palo Verde Mountains (30,403 acres)	0 acres	13,254 acres (44%)	0 acres
	Rice Valley (43,412 acres	7,881 acres (18%)	27,892 acres (64%)	0 acres

TABLE 9.4.14.2-1 (Cont.)

Feature Type	Feature Name (Total Acreage)	Feature Area or Linear Distance[a] Visible within 5 mi	Visible between 5 and 15 mi	Visible between 15 and 25 mi
WAs *(Cont.)*	Sheephole Valley (195,002 acres)	0 acres	357 acres (0.2%)	2,376 acres (1%)
	Trigo Mountains (30,046 acres)	0 acres	0 acres	3,512 acres (12%)
	Turtle Mountains (182,610 acres)	0 acres	0 acres	13,827 acres (8%)
NWRs	Cibola (18,398 acres)	0 acres	7,336 acres (40%)	9,785 acres (53%)
	Imperial (31,465 acres)	0 acres	0 acres	1,749 acres (6%)
National Natural Landmarks	Turtle Mountains (50,057 acres)	0 acres	0 acres	2,355 acres (5%)
ACECs designated for outstanding scenic values	Corn Springs (2,463 acres)	352 acres (14%)	723 acres (29%)	0 acres
	Turtle Mountains (50,057 acres)	0 acres	0 acres	2,355 acres (5%)

[a] To convert acres to km^2, multiply by 0.004047; to convert mi to km, multiply by 1.609.

[b] Percentage of total feature area for areal features.

National Conservation Areas

- *California Desert Conservation Area*—The CDCA is a 26-million-acre (105,000-km^2) parcel of land in southern California designated by Congress in 1976 through the Federal Land Policy and Management Act. About 10 million acres (40,000 km^2) of the CDCA is administered by the BLM. The proposed Riverside East SEZ is located within the CDCA.

- The CDCA management plan notes the "superb variety of scenic values" in the CDCA (BLM 1980), and lists scenic resources as needing management to preserve their value for future generations. The CDCA management plan

GOOGLE EARTH™ VISUALIZATIONS

The visual impact analysis discussion in this section utilizes three-dimensional Google Earth™ perspective visualizations of hypothetical solar facilities placed within the SEZ. The visualizations include simplified wireframe models of a hypothetical solar power tower facility. The models were placed at various locations within the SEZ as visual aids for assessing the approximate size and viewing angle of utility-scale solar facilities. The visualizations are intended to show the apparent size, distance, and configuration of the SEZ, as well as the apparent size of a typical utility-scale solar power tower project and its relationship to the surrounding landscape, as viewed from potentially sensitive visual resource areas within the viewshed of the SEZ.

The visualizations are not intended to be realistic simulations of the actual appearance of the landscape or of proposed utility-scale solar energy projects. The placement of models within the SEZ did not reflect any actual planned or proposed projects within the SEZ and did not take into account engineering or other constraints that would affect the siting or choice of facilities for this particular SEZ. The number of facility models placed in the SEZ does not reflect the 80% development scenario analyzed in this PEIS, but the discussion of expected visual contrast levels does account for the 80% development scenario. A solar power tower was chosen for the models because the unique height characteristics of power tower facilities make their visual impact potential extend beyond other solar technology types.

divides CDCA lands into multiple-use classes based on management objectives. The class designations govern the type and degree of land use actions allowed within the areas defined by class boundaries. All land use actions and resource-management activities on public lands within a multiple-use class delineation must meet the guidelines given for that class.

The proposed SEZ is within areas classified as multiple use classes “L” and “M.” The area of the SEZ around Joshua Tree NP and east of Palen-McCoy WA is designated as Class “L.” Class “L” protects sensitive, natural, scenic, ecological, and cultural resource values. Class “L” management provides for generally lower intensity, carefully controlled multiple use of resources, while ensuring that sensitive values are not significantly diminished. Multiple-Use Class “M” (Moderate Use) is based upon a controlled balance between higher intensity use and protection of public lands. This class provides for a wide variety of present and future uses such as mining, livestock grazing, recreation, energy, and utility development. Class “M” management is also designed to conserve desert resources and to mitigate damage to those resources caused by permitted uses.

- Utility-scale solar development within the SEZ would be an allowable use under the CDCA management plan, assuming mitigation measures were used to minimize visual impacts; however, construction and operation of solar facilities under the PEIS development scenario would result in substantial visual impacts on the SEZ and some surrounding lands within the SEZ viewshed that could not be completely mitigated.

- Portions of the CDCA within the 650-ft (198.1-m) viewshed for the Riverside East SEZ include approximately 1,494,552 acres (6,048 km^2), or 6% of the total CDCA acreage. Portions of the CDCA within the 24.6-ft (7.5-m) viewshed encompass approximately 1,048,201 acres (4,242 km^2), or 4% of the total CDCA acreage.

National Parks

- *Joshua Tree NP*—A portion of the eastern boundary of Joshua Tree NP is adjacent to the SEZ's northwestern boundary, and other portions of the NP are located between 0.2 and 2.5 mi (0.3 to 4 km) of the SEZ. The park contains paved roads popular for scenic driving, several miles of hiking trails, and four-wheel drive roads. There are campgrounds; backcountry camping and hiking are allowed; and the park is a popular winter climbing area. Stargazing is popular year-round, as is bird watching. Most of the park's services and facilities are in the western portion of the park, as is most recreational use; however, the undeveloped wilderness portions of the park, including those areas near the SEZ, are visited by persons seeking solitude and wilderness experiences or engaging in other activities appropriate to the relatively undisturbed environment.

  As shown in Figure 9.4.14.2-3, the northwest-southeast trending Coxcomb Mountains within the national park project into the northwestern portion of the SEZ. Portions of the SEZ are located both northeast and southwest of the projection, in essence "wrapping around" the Coxcomb Mountains on all sides except the northwest, where the Coxcomb Mountain portion of the national park connects to the main portion of the park. The park is separated from the SEZ by State Route 177 (about 0.05 mi [0.09 km] in width) for about 4 mi (6.4 km), and approximately another 44 mi (71 km) of the park boundary is within 5 mi (8 km, the BLM VRM foreground–middleground distance) of the SEZ.

  The area of the national park within the 650-ft (198.1-m) viewshed of the SEZ includes 117,591 acres (476 km^2), or 15% of the total park acreage. The area within the 24.6-ft (7.5-m) viewshed of the SEZ includes 68,860 acres (279 km^2), or 9% of the total park acreage. The 650-ft (198.1-m) SEZ viewshed extends approximately 14.2 mi (22.9 km) into the national park from the northwestern boundary of the SEZ.

  Figure 9.4.14.2-4 is a Google Earth visualization of the SEZ as seen from an unnamed ridge in the northeastern portion of the national park, near the southeast end of the Coxcomb Mountains. The visualization includes simplified wireframe models of a hypothetical solar power tower facility. The models were placed at various locations within the SEZ, as a visual aid for assessing the approximate size and viewing angle of utility-scale solar

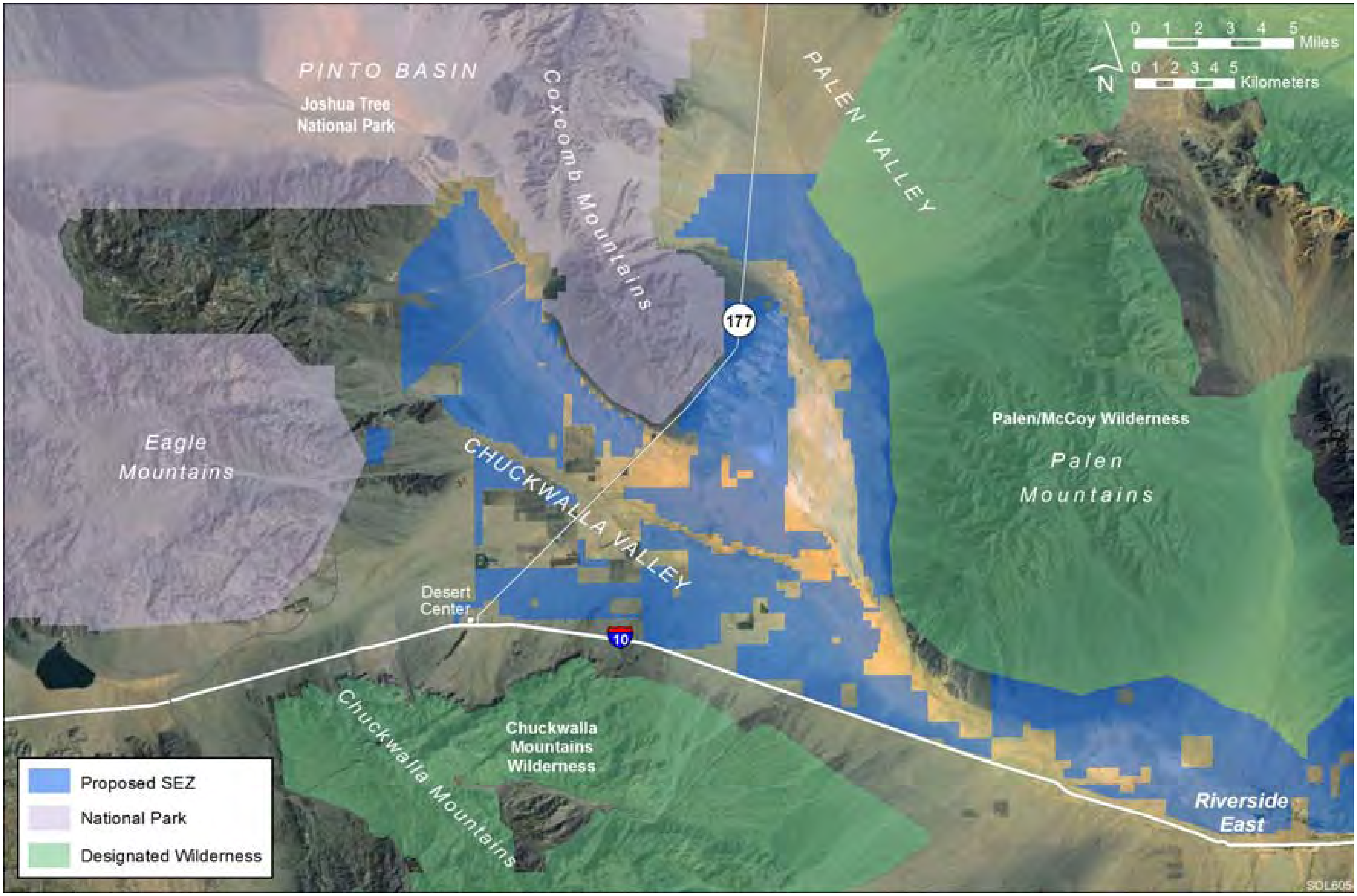

FIGURE 9.4.14.2-3 Photomap of the Proposed Riverside East SEZ (shown in blue tint) and Surrounding Lands in the Vicinity of Joshua Tree NP

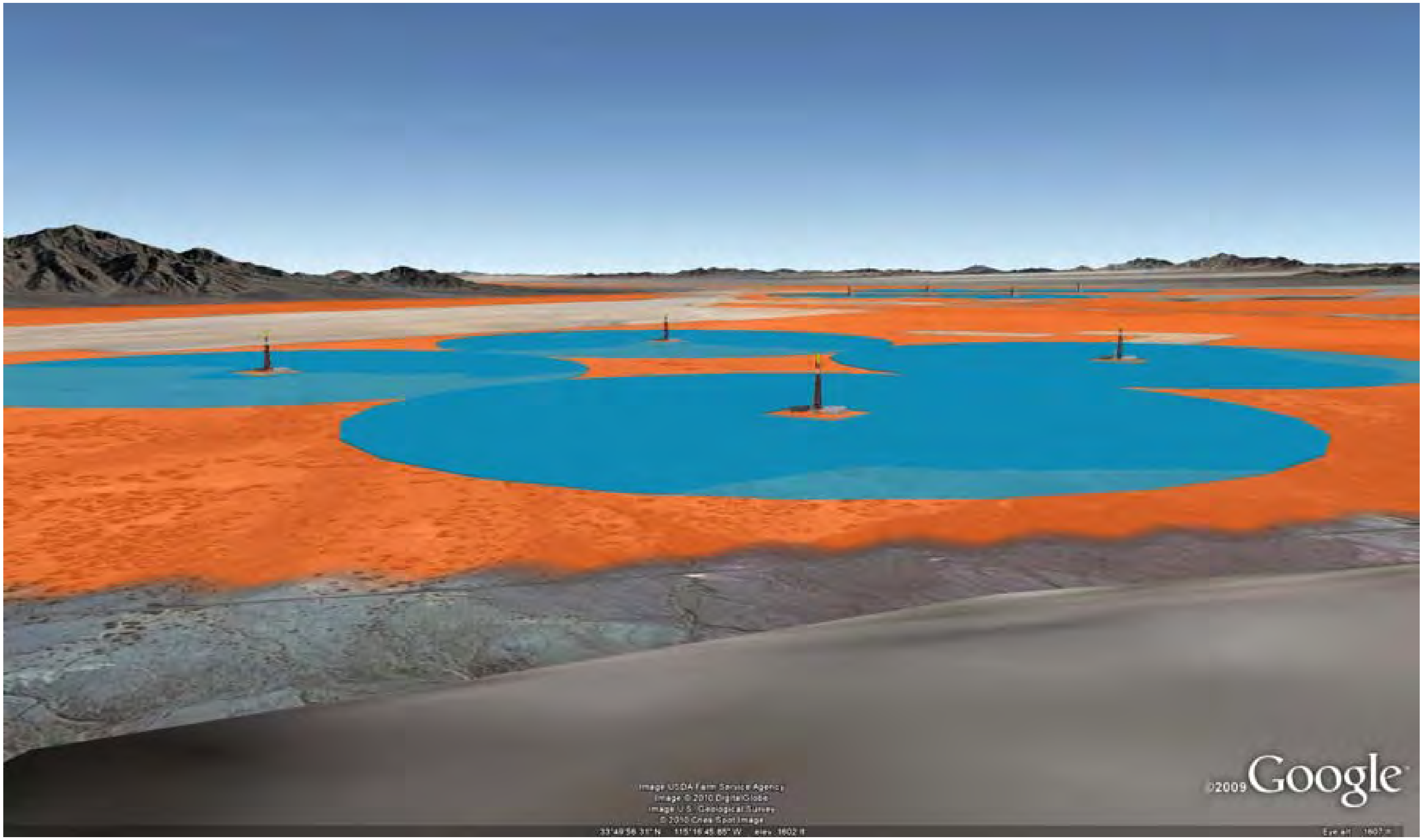

FIGURE 9.4.14.2-4 Google Earth Visualization of the Proposed Riverside East SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Viewpoint in Southeast Coxcomb Mountains within Joshua Tree NP

facilities. The receiver towers depicted in the visualization are properly scaled models of a 459-ft (139.9-m) power tower with an 867-acre (3.5-km^2) field of 12-ft (3.7-m) heliostats, each representing approximately 100 MW of electric generating capacity. Eleven groups of four models and two groups of two models were placed in the SEZ for this and other visualizations shown in this section of this PEIS. In the visualization, the SEZ area is depicted in orange, the heliostat fields in blue.

The viewpoint in the visualization is from a highpoint on the first ridge in the Coxcomb Mountains within the NP west of the SEZ, and approximately 0.8 mi (1.3 km) from the SEZ boundary. The viewpoint elevation is approximately 1,600 ft (490 m) above mean sea level, and the viewpoint is elevated roughly 1,100 ft (340 m) above the valley floor at the closest point within the SEZ.

The upper slopes and peaks of the Coxcomb Mountains are barren with little opportunity for screening. The visualization suggests that from this elevated viewpoint and very short distance to the SEZ, the SEZ would be too large to be encompassed in one view, and viewers would need to turn their heads to scan across the whole SEZ. The view direction shown in the visualization (south–southeast) is near the middle of an approximately 180-degree horizontal arc in which portions of the SEZ and associated solar facilities would be visible from this location before nearby mountains screened the view of the SEZ.

Two clusters of four power tower facility models are visible; the closest tower of the model cluster in the immediate foreground is approximately 1.8 mi (2.8 km) from the viewpoint, and the closest tower of the model cluster in the background is approximately 9.0 mi (14.5 km) from the viewpoint. The potential visual contrast expected for this viewpoint would vary depending on project locations, technologies, and site designs; however, if facilities were located at these distances, the following might be observed: The tops of solar collector/reflector arrays in the closest parts of the SEZ would be visible. Details of array components (mirrors, panels, dishes, heliostats, and so on) would likely be visible and could be a source of reflections. At short distances, the effects of atmospheric haze would be reduced, so that any bright colors on facilities and shadow contrasts might be easily seen. Worker activity would likely be visible as well.

Taller ancillary facilities, such as buildings, transmission structures, and cooling towers, and plumes (if present) likely would be visible projecting above the collector/reflector arrays, and their structural details could be evident at least for nearby facilities. The ancillary facilities could create form and line contrasts with the strongly horizontal, regular, and repeating forms and lines of the collector/reflector arrays. Color and texture contrasts would also be likely, but their extent would depend on the materials and surface treatments utilized in the facilities.

If power towers were present within the SEZ, when operating, receivers at distances of a few miles or less would likely appear as brilliant nonpoint (i.e., having visible cylindrical or rectangular surfaces) light sources atop clearly discernable tower structures against the backdrop of the valley floor and could potentially cause discomfort when looked at directly. Also, during certain times of the day from certain angles, sunlight on dust particles in the air might result in the appearance of light streaming down from the tower(s). The power towers likely would strongly attract visual attention, as seen from this viewpoint.

At night, if sufficiently tall, the power towers could have red or white flashing hazard navigation lights that would likely be visible from the national park and could be very conspicuous from this viewpoint, given the dark night skies in the vicinity of the SEZ. Other lighting associated with solar facilities in the SEZ could potentially be visible as well, at least for facilities in the closest portions of the SEZ.

Facilities at greater distances from the viewpoint would be seen at a lower viewing angle, and because the facilities would be seen more edge-on, the visible area of the facilities would be much smaller. Facilities sufficiently far away would appear as lines or thin bands that would tend to repeat the line of the horizon, reducing visual contrast. Atmospheric haze would tend to reduce color contrast and the sharpness of shadows and strong geometric outlines of facility components and, when combined with the low viewing angle, could make distant facilities harder to discern from the background textures, colors, and forms.

Because the viewpoint in this visualization is elevated and very close to the SEZ, the SEZ would occupy most of the field of view, and under the 80% development scenario analyzed in this PEIS, solar facilities within the SEZ would likely dominate the view from this location. Because there could be numerous solar facilities within the SEZ, a variety of technologies employed, and a range of supporting facilities that would contribute to visual impacts, a visually complex, man-made appearing industrial landscape could result. This essentially industrial-appearing landscape would contrast greatly with the surrounding natural-appearing lands and would be expected to create strong visual contrasts as viewed from this location within the NP.

Figure 9.4.14.2-5 is a Google Earth visualization of the SEZ as seen from within the national park on the Chuckwalla Valley floor, near State Route 177, beyond the southern end of the Coxcomb Mountains. The viewpoint is at the same elevation as the valley floor at the closest point within the SEZ and is located approximately 0.4 mi (0.7 km) from the nearest point on the northern

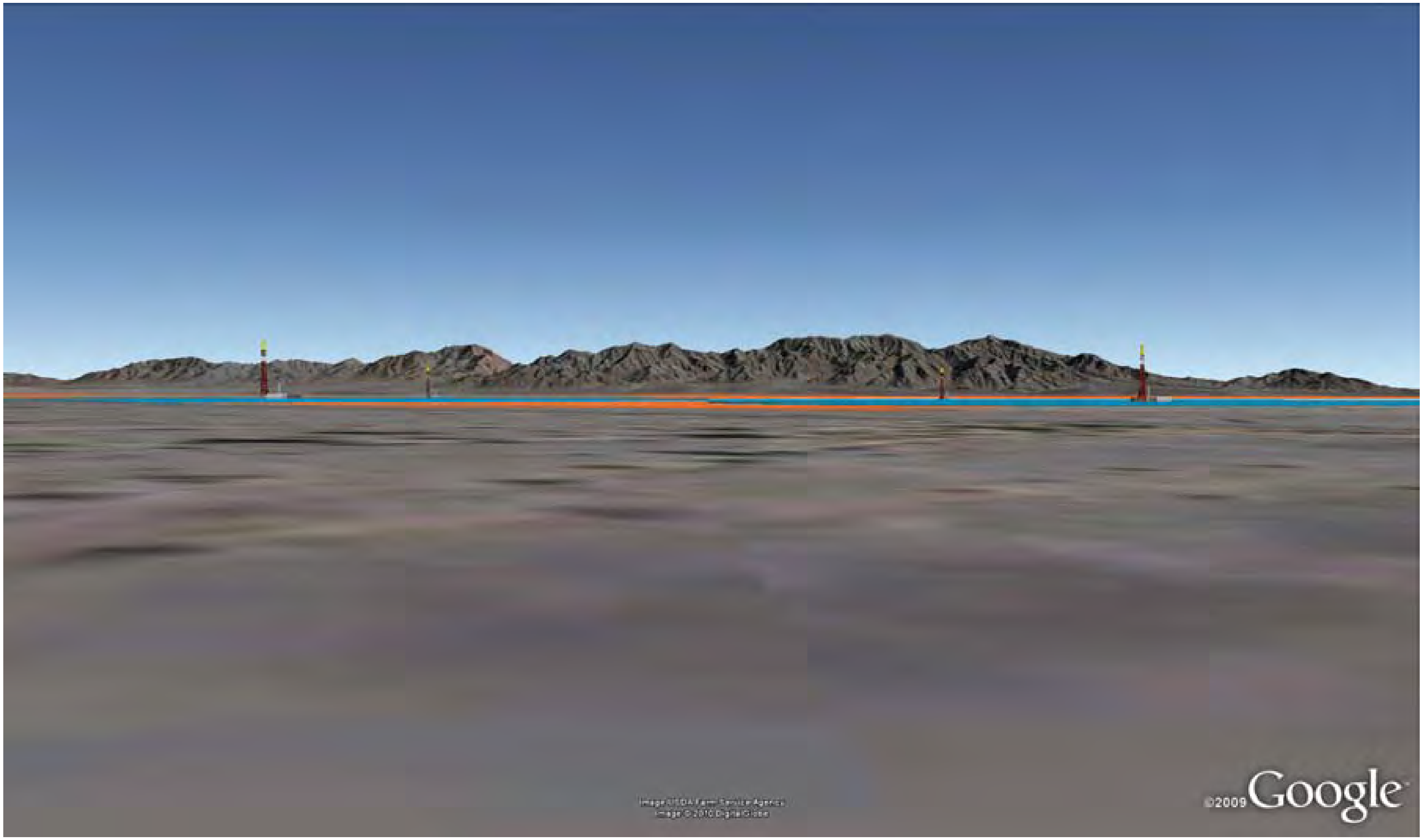

FIGURE 9.4.14.2-5 Google Earth Visualization of the Proposed Riverside East SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Viewpoint near State Route 177 within Joshua Tree NP

boundary of the SEZ. The viewpoint is less than 0.1 mi (0.2 km) northwest of State Route 177, and the views from this location are very similar to what would be seen by travelers on State Route 177. The view direction shown in the visualization (east–southeast) is near the middle of an approximately 260-degree horizontal arc in which portions of the SEZ and associated solar facilities would be visible from this location before nearby mountains screened the view of the SEZ.

The visualization suggests that from this very short distance to the SEZ, the SEZ would be too large to be encompassed in one view, and viewers would need to turn their heads to scan across the whole SEZ. One cluster of four power tower facility models is visible; the two closest towers are nearly equidistant from the viewpoint at approximately 2 mi (3.2 km).

The visualization suggests that despite the very short distance to the power towers and associated collector/reflector arrays, because the viewpoint is at the same elevation as the facility, the collector/reflector arrays would be viewed nearly edge-on, greatly reducing the visible area for each facility, and presenting a banded appearance that would repeat the line of the horizon, tending to reduce visual contrast. If nearby facilities used PV systems and low-profile ancillary facilities, the visual impacts would be minimized, but for facilities utilizing STGs, there would be taller structures visible projecting above the collector/reflector arrays, and in some conditions steam plumes could be present that would add significantly to visual contrasts. These taller elements would add vertical line and form contrasts, and likely color contrasts as well; steam plumes would add color, and possibly line or form contrasts, depending on conditions. Depending on height, these ancillary facilities could add significantly to visual contrasts for some facilities. The tops of solar collector/reflector arrays in the closest parts of the SEZ likely would not be visible.

If power towers were present within the SEZ, when operating, nearby receivers likely would appear as brilliant nonpoint (i.e., having visible cylindrical or rectangular surfaces) light sources atop clearly discernable tower structures against the backdrop of the sky above the Palen Mountains or against the mountain slopes, and could potentially cause discomfort when looked at directly. Also, during certain times of the day from certain angles, sunlight on dust particles in the air might result in the appearance of light streaming down from the tower(s). The power towers likely would strongly attract visual attention, as seen from this viewpoint. More distant receivers likely would appear as distant points of light against the sky, against the backdrop of the valley floor, or against the bajadas and slopes of the Palen Mountains.

At night, if sufficiently tall, the power towers could have red or white flashing hazard navigation lights that would likely be visible from the national park and could be very conspicuous from this viewpoint, given the dark night skies in the vicinity of the SEZ. Other lighting associated with solar facilities in the SEZ could potentially be visible as well, at least for facilities in the closest portions of the SEZ.

The nature of the visual contrasts from solar facilities in the SEZ as observed from this location would depend on the numbers, types, sizes, and locations of solar facilities in the SEZ and on other project- and site-specific factors, but because the viewpoint is very close to the SEZ, the SEZ would occupy the entire horizontal field of view, and under the 80% development scenario analyzed in this PEIS, solar facilities within the SEZ would likely dominate the view from this location. Because there could be numerous solar facilities within the SEZ, with a variety of technologies employed, and a range of supporting facilities that would contribute to visual impacts, a visually complex, man-made appearing industrial landscape could result. This essentially industrial-appearing landscape would contrast greatly with the surrounding natural-appearing lands and would be expected to create strong to very strong visual contrasts as viewed from this location within the NP.

Figure 9.4.14.2-6 is a Google Earth visualization of the SEZ as seen from a mountain peak north of the Pinto Basin, at the northwestern end of the Coxcomb Mountains within the NP. The viewpoint elevation is approximately 4,300 ft (1,300 m), about 3,400 ft (1,040 m) above the valley floor at the closest point within the SEZ. The viewpoint is located approximately 8 mi (13 km) from the nearest point on the northern boundary of the SEZ. The view direction shown in the visualization is southeast.

The visualization suggests that from this longer distance deeper into the NP, the SEZ can be encompassed in one view. Five clusters of four power tower facility models are visible; the two closest towers are nearly equidistant from the viewpoint at approximately 10 mi (16 km). The farthest tower visible in the image (visible just beyond the end of the Coxcomb Mountains) is approximately 26 mi (42 km) from the viewpoint.

The visualization shows that while facilities in the SEZ would be viewed at relatively long distances, from this viewpoint height the tops of solar collector/reflector arrays could be seen, increasing the apparent size of the facility, changing its apparent shape, and increasing potential for glinting and glare. The visualization also shows that the SEZ is large enough that even at relatively long distances, it can occupy a substantial portion of the field of view.

The potential visual contrast expected for this viewpoint would depend on the numbers, types, sizes, and locations of solar facilities in the SEZ and on other project- and site-specific factors, but while the viewpoint is 8 mi (13 km) from the SEZ, the SEZ would occupy nearly the entire horizontal field of view.

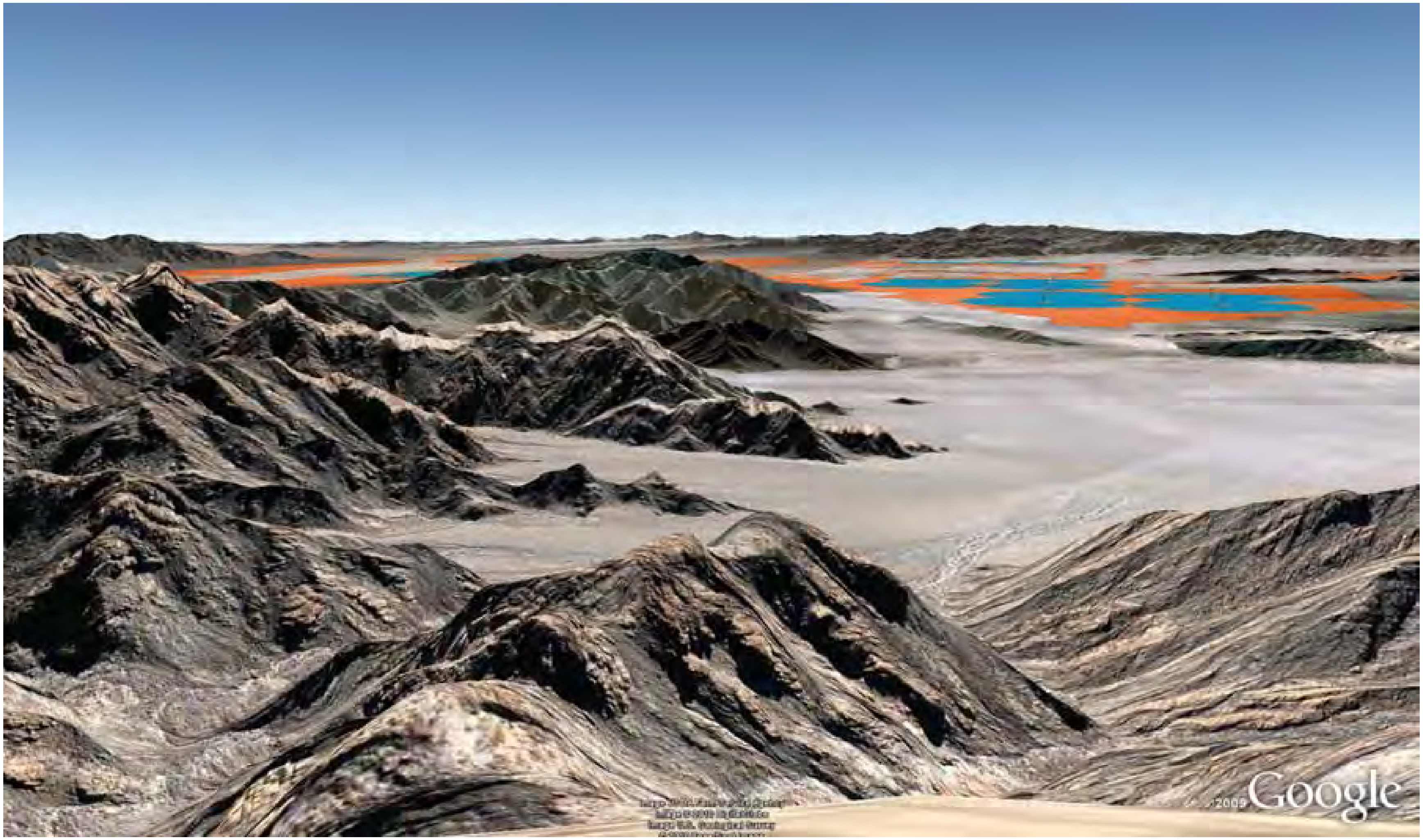

FIGURE 9.4.14.2-6 Google Earth Visualization of the Proposed Riverside East SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Viewpoint in Northwest Coxcomb Mountains within Joshua Tree NP

Under the 80% development scenario analyzed in this PEIS, solar facilities within the SEZ would attract visual attention, and would be expected to create strong visual contrasts as viewed from this location within the NP.

Figure 9.4.14.2-7 is a Google Earth visualization of the SEZ as seen from a peak within the Eagle Mountains. The viewpoint elevation is approximately 4,000 ft (1,300 m), about 3,200 ft (580 m) above the valley floor at the closest visible point within the SEZ. The viewpoint is located approximately 11 mi (18 km) from the nearest point on the far western boundary of the SEZ. The view direction shown in the visualization is east. Two clusters of four power tower facility models are partially visible; the closest towers are approximately 15 mi (24 km) from the viewpoint.

The visualization shows a more typical view of the SEZ from the interior of the national park. The mountainous portions of the park are quite rugged, and many views out of the park toward the SEZ would be partially or fully screened by intervening terrain. In this case, much of the view of the distant SEZ is screened by mountains along the eastern edge of the Eagle Mountains. A portion of the SEZ is visible, but solar facilities in the visible area would be distant and seen edge-on. The SEZ occupies too small a portion of the field of view to be visually dominant.

Power tower receivers visible within the SEZ would likely appear as points of light near the eastern horizon; lower height facilities might be difficult to distinguish at the long distances involved, at least in many lighting conditions. At night, if sufficiently tall, the power towers could have red or white flashing hazard navigation lights that likely would be visible from this viewpoint, given the dark night skies in the vicinity of the SEZ.

The potential visual contrast expected for this viewpoint would depend on the numbers, types, sizes and locations of solar facilities in the SEZ and on other project- and site-specific factors. Under the 80% development scenario analyzed in this PEIS, solar facilities within the SEZ would be expected to create weak visual contrasts as viewed from this location within the park.

In summary, Joshua Tree NP borders or is very close to the border of the SEZ, and the southeastern part of the Coxcomb Mountains is essentially surrounded by the SEZ in all directions except looking northwest into the main part of the park. Many of the higher elevations in the Coxcomb Mountains have unobstructed, panoramic views of the SEZ from relatively short distances and elevated viewpoints, a situation conducive to strong levels of visual contrast, especially given the large size of the SEZ and the number, size, and variety of solar facilities that might be visible under the 80% development scenario analyzed in this PEIS. These viewpoints and similar viewpoints would likely be subject to strong levels of visual contrast resulting from solar development within the SEZ under the 80% development scenario. Lower elevation

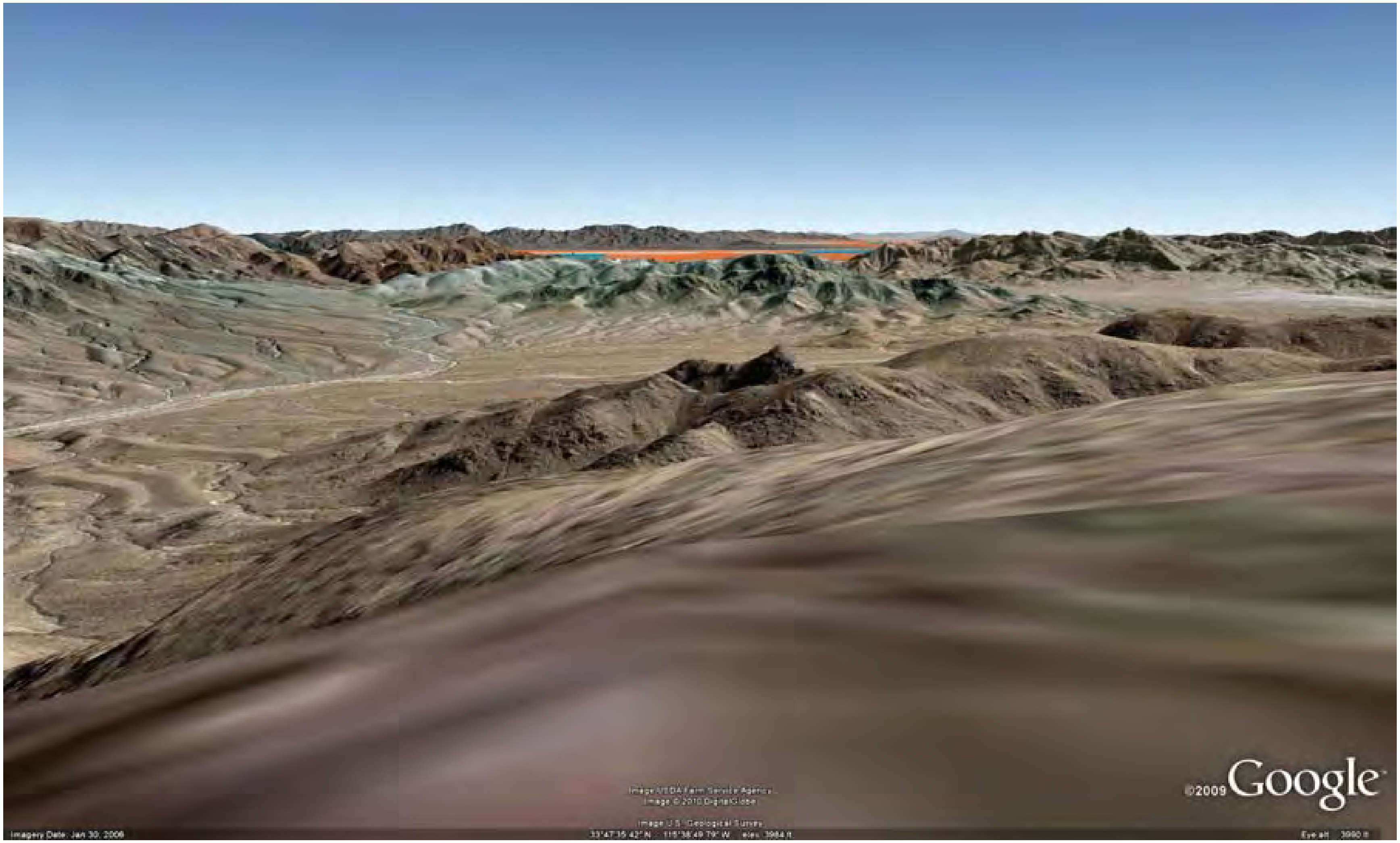

FIGURE 9.4.14.2-7 Google Earth Visualization of the Proposed Riverside East SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Viewpoint in Eagle Mountains within Joshua Tree NP

viewpoints are more likely to be screened by nearby topography, and there are many locations in the park, for example, in valleys, where views of the SEZ are completely screened. Lower elevation viewpoints with clear views of the SEZ will have lower viewing angles, which would be expected to reduce contrasts, but many viewpoints could still be subject to strong visual contrasts. Farther to the west, in the interior of the park, contrasts would be reduced as screening increased and distance to the SEZ increased. Solar facilities within the SEZ might be visible, but they would be either too far or too small in apparent size to cause substantial visual contrasts.

Note that some locations within the Coxcomb Mountains and within the main portion of the park also have partial views of the much more distant proposed Iron Mountain SEZ. Overall, under the 80% development scenario analyzed in this PEIS, solar energy development in the Iron Mountain SEZ would be expected to result in much weaker visual impacts on Joshua Tree NP than expected from development within the Riverside East SEZ, but where views of both SEZs existed, additional impacts to those described here would occur.

Wilderness Areas

- *Big Maria Mountains WA*—The 46,056-acre (186-km^2) Big Maria Mountains is a congressionally designated wilderness area located adjacent to the northeast corner of the SEZ. It then runs parallel to the northeastern boundary and is 0.3 mi (0.5 km) at the point of closest approach east of the SEZ. The Big Maria Mountains contain gently sloping bajadas and rough, craggy peaks separated by steep canyons. Camping, hunting, hiking, backpacking, horseback riding, and wildlife viewing are recreational activities in the wilderness area. There are no trails, but there are abandoned jeep tracks that are used for hiking.

  As shown in Figure 9.4.14.2-2, much of the eastern portion of the SEZ is visible from the south- and southwest-facing slopes of the Big Maria Mountains within the wilderness area. Portions of the wilderness area within the 650-ft (198.1-m) SEZ viewshed (approximately 8,875 acres [36 km^2], or 19% of the total WA acreage), extend from the point of closest approach at the northeast corner of the SEZ to approximately 0.9 mi (1.5 km) from the SEZ. Portions of the WA within the 24.6-ft (7.5-m) SEZ viewshed encompass approximately 7,420 acres (30.0 km^2), or 16% of the total WA acreage.

  Figure 9.4.14.2-8 is a Google Earth visualization of the SEZ (highlighted in orange) as seen from an unnamed peak in the Big Maria Mountains, elevated roughly 3,100 ft (940 m) above the bajada at the closest point within the SEZ, and 3,600 ft (1,100 m) above the lowest point in the SEZ. The viewpoint is approximately 2.0 mi (3.2 km) from the nearest point on the northeastern boundary of the SEZ.

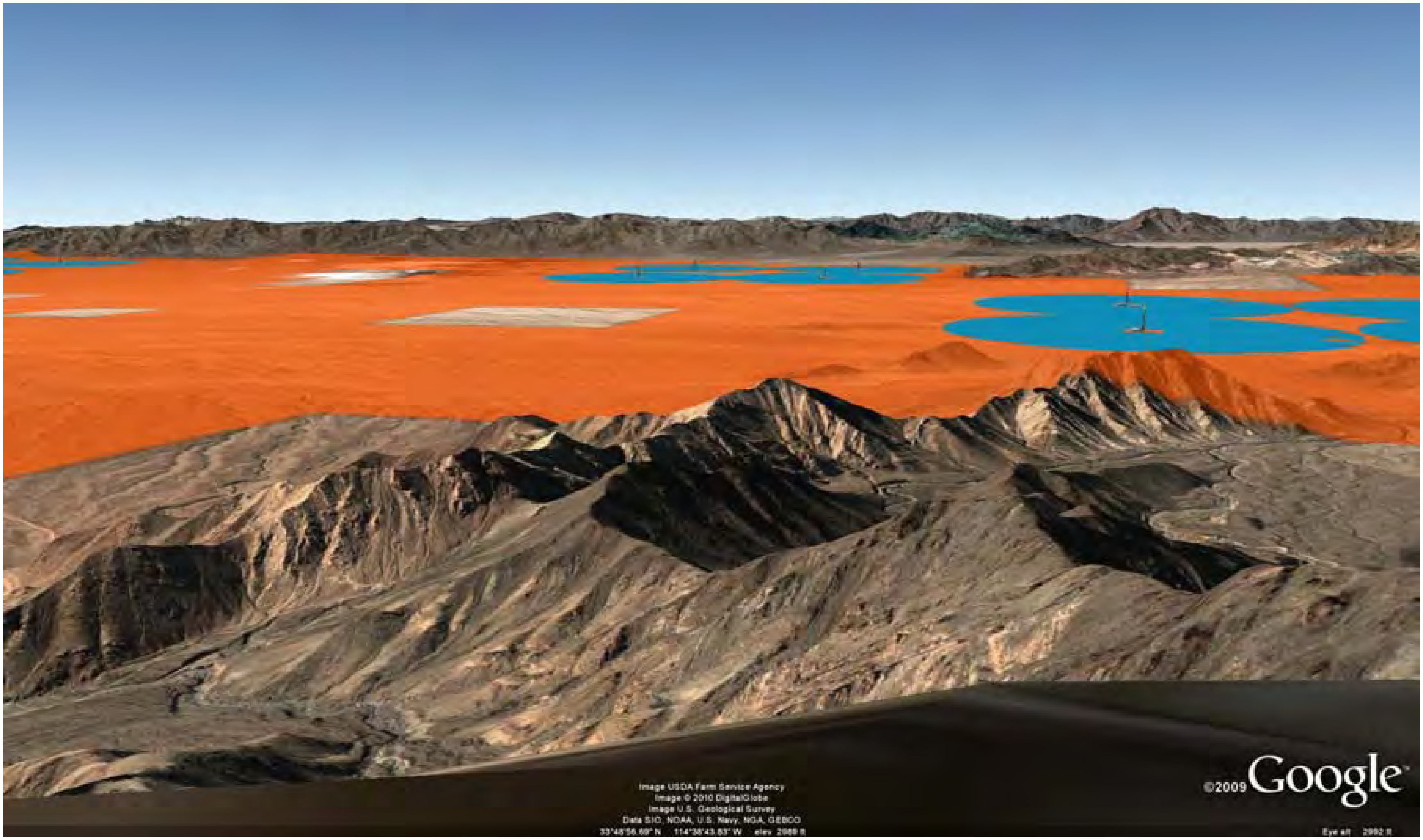

FIGURE 9.4.14.2-8 Google Earth Visualization of the Proposed Riverside East SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from a Peak in Big Maria Mountains WA

The visualization suggests that from this elevated viewpoint and very short distance to the SEZ, the SEZ would be too large to be encompassed in one view, and viewers would need to turn their heads to scan across the whole SEZ. Three clusters of power tower facility models are visible; the right-most model cluster is approximately 5 mi (8 km) from the viewpoint, and the right center model cluster is 9 mi (15 km) from the viewpoint (both distances to center points of model clusters). The tops of solar collector/reflector arrays in the closest parts of the SEZ would be visible, and the angle of view is high enough that these closer facilities would not repeat the horizontal line of the valley plain. Because of the oblique angle of view, the facilities would appear larger in areal extent than they would from less elevated viewpoints at the same distance, and the strong regular geometry of the collector/reflector arrays would be apparent. These factors would increase visual contrast relative to lower angle views. collector/reflector arrays

Taller ancillary facilities, such as buildings, transmission structures, and cooling towers, and plumes (if present) would likely be visible projecting above the collector/reflector arrays, and their structural details could be evident, at least for nearby facilities. The ancillary facilities could create form and line contrasts with the strongly horizontal, regular, and repeating forms and lines of the collector/reflector arrays. Color and texture contrasts would also be likely, but their extent would depend on the materials and surface treatments utilized in the facilities.

If power towers were present within the SEZ, when operating, the receivers at short distances would likely appear as brilliant white nonpoint (i.e., having visible cylindrical or rectangular shapes) atop clearly discernable tower structures against the backdrop of the valley floor, while power tower receivers at the longer distances shown here would appear as points of light against the backdrop of the valley floor or the bajadas of the McCoy Mountains. During certain times of the day from certain angles, sunlight on dust particles in the air might result in the appearance of light streaming down from nearby power tower(s).

At night, if sufficiently tall, the power towers could have red or white flashing hazard navigation lights that likely would be visible from the wilderness area, and could be very conspicuous from this viewpoint, given the dark night skies in the vicinity of the SEZ. Other lighting associated with solar facilities in the SEZ could potentially be visible as well, at least for facilities in the closest portions of the SEZ.

The potential visual contrast expected for this viewpoint would depend on the numbers, types, sizes and locations of solar facilities in the SEZ and on other project- and site-specific factors, but because the viewpoint is elevated and very close to the SEZ, the SEZ would occupy most of the field of view, stretching across the Chuckwalla Valley floor to the bajadas of the McCoy

Mountains. Under the 80% development scenario analyzed in this PEIS, there could be numerous solar facilities within the SEZ, a variety of technologies employed, and a range of supporting facilities that would contribute to visual impacts, such as transmission towers and lines, substations, power block components, and roads. The resulting visually complex landscape would be essentially industrial in appearance and would contrast greatly with the surrounding mostly natural-appearing landscape. Solar facilities within the SEZ would likely dominate the view from this location and would be expected to create very strong visual contrasts as viewed from this location within the wilderness area.

Most southwest-facing slopes of the Big Maria Mountains within the WA have views similar to that shown in Figure 9.4.14.2-8. At lower elevations, the angle of view is lower, so facilities appear more edge-on, but even at the lowest elevations within the WA, where there is a view of the SEZ, it occupies so much of the field of view that strong visual contrasts from solar development within the SEZ would be likely. Lower levels of visual contrast would be expected for viewpoints farther northeast in the WA, where intervening mountains would be likely to screen views of the SEZ partially.

- *Chuckwalla Mountains WA*—The 88,202-acre (357-km^2) Chuckwalla Mountains is a congressionally designated wilderness area located 1.1 mi (1.8 km) at the point of closest approach south of the western portion of the SEZ. Rough, boulder-strewn hillsides and washes, thick with vegetation, allow opportunities for visitors to enjoy seclusion. Elevation varies widely from the low-lying bajada at 800 ft (244 m) to the area's highest peak, Black Butte, reaching up to 4,450 ft (1,356 m).

  The southern and western portions of the SEZ are visible from the bajada and northern slopes and peaks of the wilderness area, but numerous areas in the mountains farther south in the WA also have views of the SEZ. Portions of the wilderness area within the 650-ft (198.1-m) SEZ viewshed (approximately 49,913 acres [202 km^2], or 57% of the total wilderness area acreage) extend from the point of closest approach at the southern boundary of the SEZ to approximately 5.9 mi (9.5 km) from the SEZ. Portions of the wilderness area within the 24.6-ft (7.5-m) viewshed encompass approximately 47,186 acres (191 km^2), or 54% of the total wilderness area acreage.

  Figure 9.4.14.2-9 is a Google Earth visualization of the SEZ as seen from an unnamed peak in the far northern Chuckwalla Mountains within the wilderness area, south of the western end of the SEZ and approximately 3 mi (5 km) southeast of Desert Center. The viewpoint is elevated roughly 1,400 ft (430 m) above the valley floor at the closest point within the SEZ. The viewpoint is approximately 2.4 mi (3.8 km) from the nearest point on the southern boundary of the SEZ. The view direction is north.

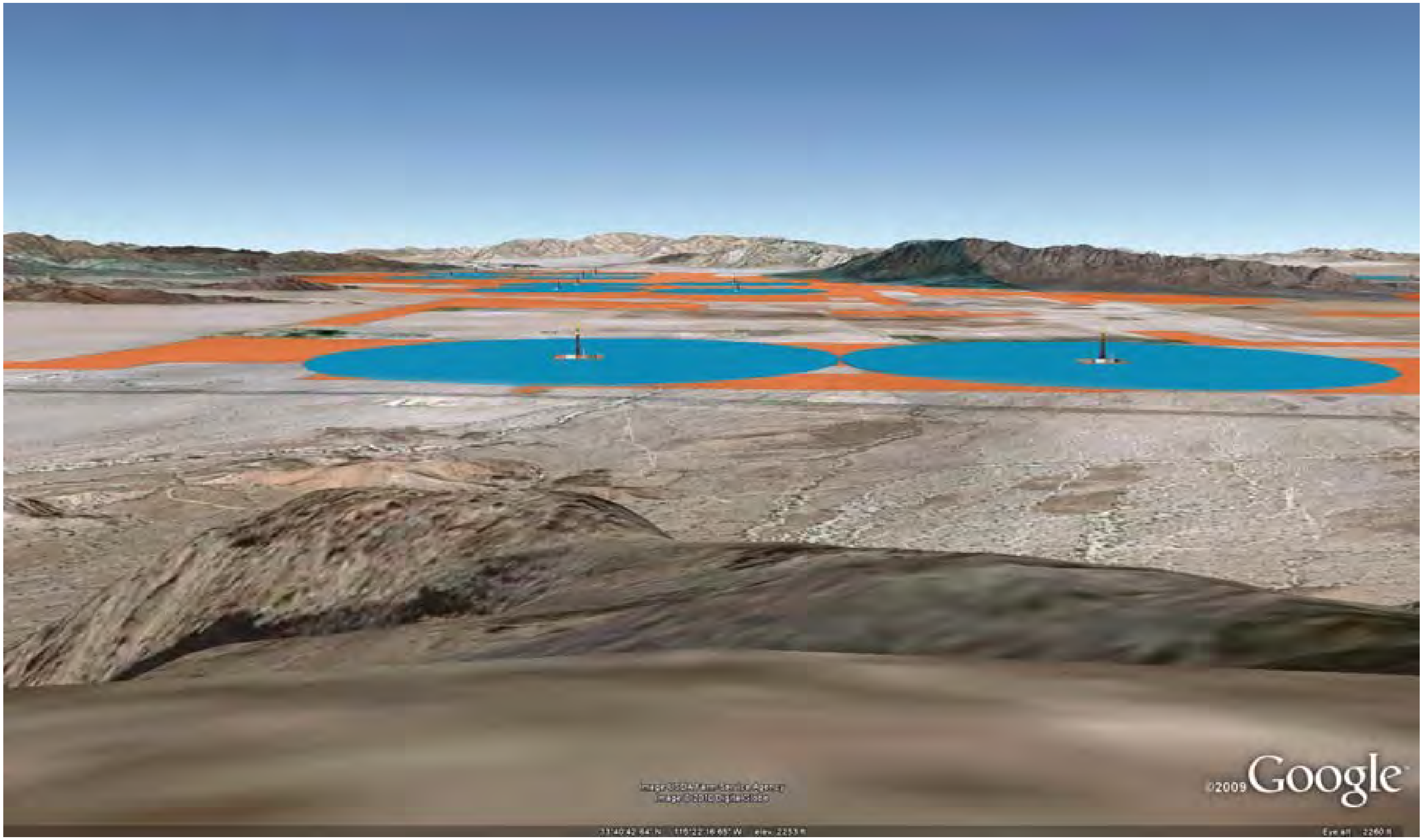

FIGURE 9.4.14.2-9 Google Earth Visualization of the Proposed Riverside East SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from a Peak in Western Portion of Chuckwalla Mountains WA

The visualization suggests that from this elevated viewpoint and very short distance to the SEZ, the SEZ would be too large to be encompassed in one view, and viewers would need to turn their heads to the right to scan across the whole SEZ, which would extend almost 90 degrees to the right. Four clusters of power tower facility models are visible; the closest tower is approximately 3 mi (5 km) from the viewpoint, and the center of the next model cluster is nearly 10 mi (16 km) from the viewpoint. From this vantage point, the tops of solar collector/reflector arrays in the closest parts of the SEZ would be visible, and the angle of view is high enough that these closer facilities would not repeat the horizontal line of the valley plain. Because of the oblique angle of view, the facilities would appear larger in areal extent than they would from less elevated viewpoints at the same distance.

Taller ancillary facilities, such as buildings, transmission structures, and cooling towers, and plumes (if present) likely would be visible projecting above the collector/reflector arrays, and their structural details could be evident at least for nearby facilities. The ancillary facilities could create form and line contrasts with the strongly horizontal, regular, and repeating forms and lines of the collector/reflector arrays. Color and texture contrasts would also be likely, but their extent would depend on the materials and surface treatments utilized in the facilities.

If power towers were present within the SEZ at the distance corresponding to the closest tower in the model, the receivers would likely appear as brilliant nonpoint (i.e., having visible cylindrical or rectangular surfaces) light sources atop clearly discernable tower structures against the backdrop of the valley floor, while power tower receivers at the longer distances shown here would appear as points of light against the backdrop of the distant valley floor. For nearby power towers, during certain times of the day from certain angles, sunlight on dust particles in the air might result in the appearance of light streaming down from the tower(s). Details of solar array components and ancillary facilities might be visible in the closest parts of the SEZ.

At night, if sufficiently tall, the power towers could have red or white flashing hazard navigation lights that likely would be visible from the wilderness area and could be very conspicuous from this viewpoint, given the dark night skies in the vicinity of the SEZ; however, views would be across I-10, and lights from traffic likely would be visible. Other lighting associated with solar facilities in the SEZ could potentially be visible as well, at least for facilities in the closest portions of the SEZ.

The potential visual contrast expected for this viewpoint would depend on the numbers, types, sizes and locations of solar facilities in the SEZ and on other project- and site-specific factors, but because the viewpoint is elevated and very close to the SEZ, the SEZ would occupy most of the field of view, stretching across the Chuckwalla Valley floor almost to the bajadas of the distant Palen Mountains. Under the 80% development scenario analyzed in this PEIS, there could be numerous solar facilities within the SEZ, a variety of technologies employed, and a range of supporting facilities that would contribute to visual impacts, such as transmission towers and lines, substations, power block components, and roads. The resulting visually complex landscape would be essentially industrial in appearance and would contrast greatly with the surrounding mostly natural-appearing landscape. Under the 80% development scenario, solar facilities within the SEZ would likely dominate the view from this location and would be expected to create strong visual contrasts as viewed from this location within the wilderness area.

Figure 9.4.14.2-10 is a Google Earth visualization of the SEZ as seen from an unnamed peak in the far eastern Chuckwalla Mountains within the wilderness area, south of the southeastern end of the Coxcomb Mountains. The viewpoint is elevated roughly 1,600 ft (430 m) above the valley floor at the closest point within the SEZ. The viewpoint is approximately 5.8 mi (9.3 km) from the nearest point on the southern boundary of the SEZ. The view direction is north.

The visualization suggests that from this elevated viewpoint because of the breadth of the SEZ east-to-west, the SEZ would be too large to be encompassed in one view, and viewers would need to turn their heads to scan across the whole SEZ, which would extend over much of the northern horizon. Four clusters of power tower facility models are visible; the closest tower is approximately 8 mi (13 km) from the viewpoint, and the center of the next model cluster is 14 mi (23 km) from the viewpoint. From this vantage point, the tops of solar collector/reflector arrays in the closest parts of the SEZ would be visible, but the angle of view is low enough that these closer facilities might repeat the horizontal line of the valley plain, depending on the facility layout. The low angle of view would reduce the apparent areal extent of the facilities.

Taller ancillary facilities, such as buildings, transmission structures, and cooling towers, and plumes (if present) likely would be visible projecting above the collector/reflector arrays, and their structural details could be evident, at least for nearby facilities. The ancillary facilities could create form and line contrasts with the strongly horizontal, regular, and repeating forms and lines of the collector/reflector arrays. Color and texture contrasts would be possible for nearby facilities, but their extent would depend on the materials and surface treatments utilized in the facilities.

If power towers were present within the SEZ at the distance corresponding to the closest tower in the model, the receivers would likely appear as bright light sources atop discernable tower structures against the backdrop of the valley floor, while power tower receivers at the longer distances shown here

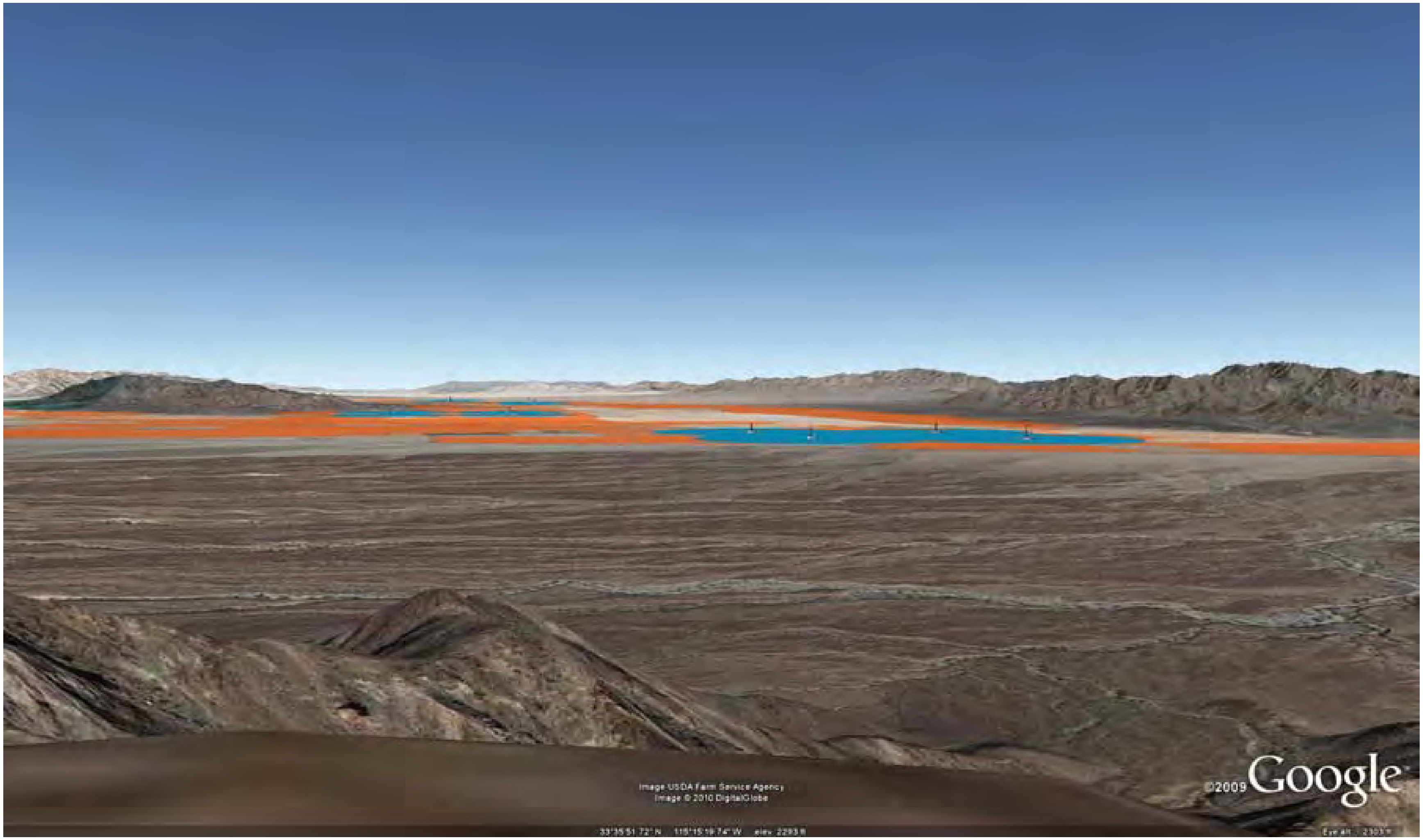

FIGURE 9.4.14.2-10 Google Earth Visualization of the Proposed Riverside East SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from a Peak in Eastern Portion of Chuckwalla Mountains WA

would appear as distant points of light against the backdrop of the distant valley floor.

At night, if sufficiently tall, the power towers could have red or white flashing hazard navigation lights that could be conspicuous from this viewpoint, given the dark night skies in the vicinity of the SEZ. Other lighting associated with solar facilities in the SEZ could potentially be visible as well, at least for facilities in the closest portions of the SEZ.

The potential visual contrast expected for this viewpoint would depend on the numbers, types, sizes and locations of solar facilities in the SEZ and on other project- and site-specific factors, but because the viewpoint is elevated and the SEZ so large, the SEZ would appear to stretch across the Chuckwalla Valley floor roughly 25 mi (40 km) to the east. Under the 80% development scenario analyzed in this PEIS, there could be numerous solar facilities within the SEZ, a variety of technologies employed, and a range of supporting facilities that would contribute to visual impacts, such as transmission towers and lines, substations, power block components, and roads. The resulting visually complex landscape would be essentially industrial in appearance and would contrast greatly with the surrounding mostly natural-appearing landscape. Under the 80% development scenario, solar facilities within the SEZ would attract attention, might dominate the view from this location, and would be expected to create strong visual contrasts as viewed from this location within the WA.

Figure 9.4.14.2-11 is a Google Earth visualization of the SEZ as seen from Corn Springs Road on the bajada in the far northeastern portion of the WA. The viewpoint is elevated about 200 ft (60 m) above the valley floor at the closest point within the SEZ, and is approximately 3.3 mi (5.4 km) from the nearest point on the boundary of the SEZ. The view looks east down I-10 to the eastern portion of the SEZ.

The SEZ in the vicinity of this viewpoint is only a few miles across, north to south, and because the elevation of the viewpoint is only minimally elevated relative to the SEZ, the SEZ and very distant heliostat arrays depicted in the power tower model cluster appear edge-on, as a very narrow band parallel to, and repeating, the strong horizon line and thus greatly reducing their visible area and associated visual contrast. The closest model is approximately 17 mi (27 km) from the viewpoint. The visualization also shows that from this viewpoint, the SEZ would be too large to be encompassed in one view, and viewers would need to turn their heads to scan across the whole SEZ, which would span much of the northern and eastern horizons.

Transmission towers could be visible above the solar collector/reflector arrays. If power towers were present within the SEZ, at the distance shown here, the receivers could appear as distant point light sources against the

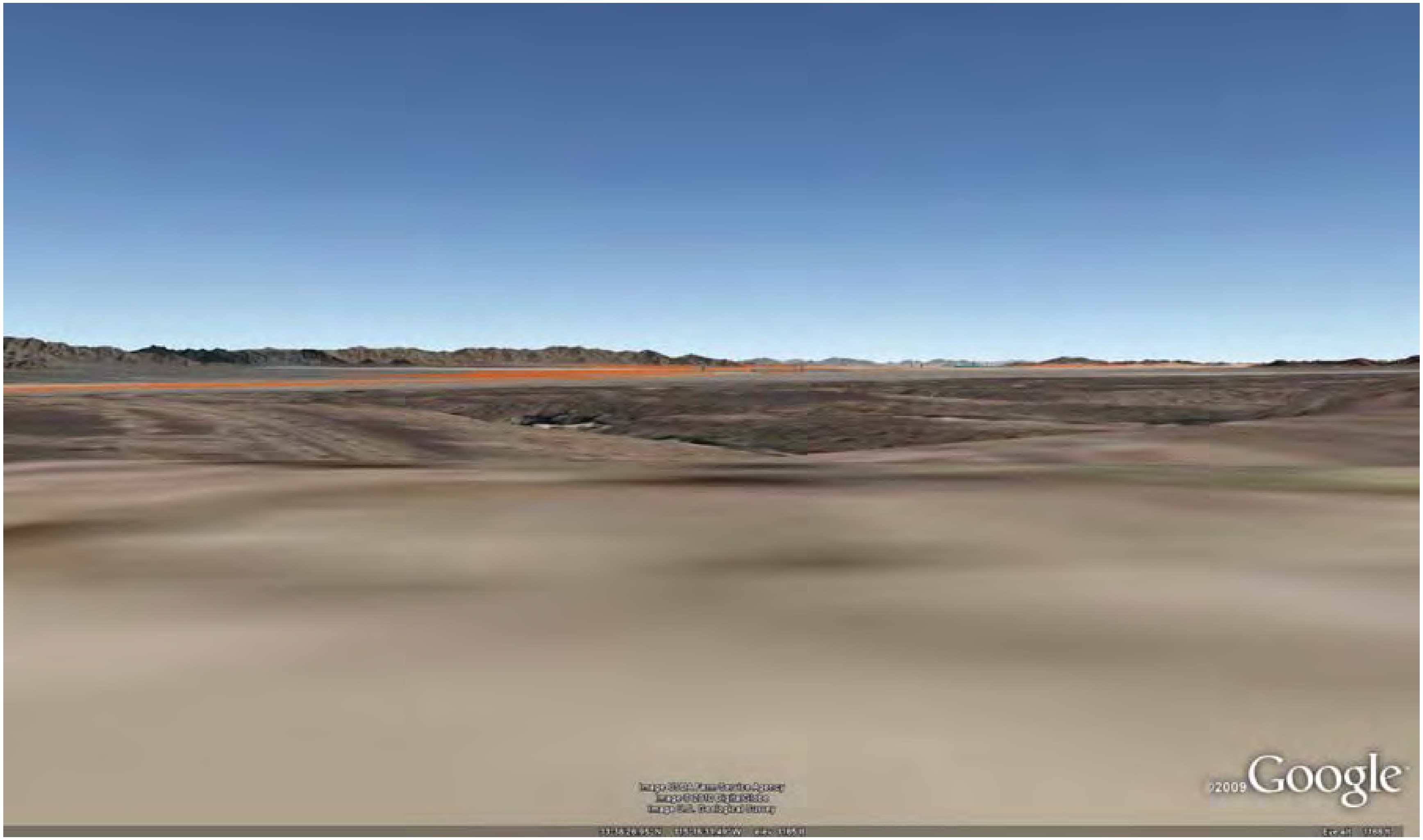

FIGURE 9.4.14.2-11 Google Earth Visualization of the Proposed Riverside East SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Corn Springs Road on Bajada in Chuckwalla Mountains WA

backdrop of the McCoy Mountains. At night, if sufficiently tall, the power towers could have red or white flashing hazard navigation lights that could be seen from this viewpoint, given the dark night skies in the vicinity of the SEZ.

The potential visual contrast expected for this viewpoint would depend on the numbers, types, sizes and locations of solar facilities in the SEZ and on other project- and site-specific factors. Under the 80% development scenario, solar facilities within the SEZ would be expected to create weak to moderate visual contrasts as viewed from this location within the wilderness area.

In summary, higher elevations in the Chuckwalla WA have extended open views of the SEZ and could be subject to high levels of visual contrast associated with solar energy development within the wilderness area. Viewpoints on the bajada would still have expansive views of the SEZ but, primarily because of the lower viewing angle, would be expected to be subjected to substantially lower levels of visual contrast.

- *Imperial Refuge WA*—The 15,714-acre (64-km^2) Imperial Refuge is a congressionally designated wilderness area managed by the USFWS located 22 mi (36 km) at the point of closest approach south of the SEZ. The wilderness area includes low, heavily vegetated land along the Colorado River as well as higher areas with less vegetation on both sides of the river. Portions of the wilderness area within the 650-ft (198.1-m) SEZ viewshed (approximately 560 acres [2 km^2], or 4% of the total wilderness area acreage) extend from the point of closest approach at the southern boundary of the SEZ to beyond 25 mi (41 km) from the SEZ. Portions of the wilderness area within the 24.6-ft (7.5-m) viewshed encompass approximately 468 acres (2 km^2), or 3% of the total wilderness area acreage.

  The far southeastern corner of the SEZ is visible from some areas within the northern portion of the wilderness area. Within 25 mi (41 km) of the SEZ, where vegetative screening is absent, solar facilities located in the far southeastern portions of the SEZ might be visible from the highest points within the wilderness area. Because of the very long distance to the SEZ and screening by the Palo Verde Mountains, visible portions of the SEZ would occupy a very small portion of the field of view. The wilderness area is at a slightly lower elevation than the SEZ. Any visible solar facilities within the SEZ would be viewed at very low angles. Solar collector/reflector arrays would be viewed edge-on and, at distance approaching 25 mi (41 km), are unlikely to be distinguishable. If power towers were visible, they would likely appear as distant point light sources on the northern horizon. At night, if sufficiently tall, the power towers could have red or white flashing hazard navigation lights that could be visible from the wilderness area. Visual impacts on the Imperial Refuge WA from solar development within the SEZ would be expected to be minimal.

- *Joshua Tree WA*—Joshua Tree is a 586,623-acre (2,374-km^2) congressionally designated wilderness area managed by the NPS and located entirely within Joshua Tree NP. A section of the WA divides the western portion of the SEZ and is located adjacent to its boundaries. This section is almost entirely within the viewshed. Portions of the wilderness area within the 650-ft (198.1-m) SEZ viewshed (approximately 99,460 acres [403 km^2], or 17% of the total wilderness area acreage) extend from the point of closest approach at the northwestern boundary of the SEZ to approximately 13.6 mi (21.9 km) northwest from the SEZ. Portions of the wilderness area within the 24.6-ft (7.5-m) viewshed encompass approximately 55,203 acres (224 km^2), or 9% of the total wilderness area acreage. Expected visual contrast levels for the wilderness area are the same as those expected for the national park (see above).

- *Little Chuckwalla Mountains WA*—The 28,708-acre (116-km^2) Little Chuckwalla Mountains is a congressionally designated wilderness area located 5.0 mi (8.1 km) at the point of closest approach south of the SEZ. The wilderness area contains rugged mountains surrounded by a large, gently sloping bajada with a network of washes.

  Within the wilderness area, the SEZ is visible from the north- and northwest-facing slopes and the peaks of the Little Chuckwalla Mountains, as well as all of the north-facing bajada and the southern portions of the south-facing bajada. Portions of the wilderness area within the 650-ft (198.1-m) SEZ viewshed (approximately 16,729 acres [68 km^2], or 58% of the total wilderness area acreage) extend from the point of closest approach at the southern boundary of the SEZ to approximately 14.0 mi (23 km) from the SEZ. Portions of the wilderness area within the 24.6-ft (7.5-m) viewshed encompass approximately 14,319 acres (58 km^2), or 50% of the total wilderness area acreage.

  Figure 9.4.14.2-12 is a Google Earth visualization of the SEZ as seen from a high, unnamed peak in the Little Chuckwalla Mountains, in the far eastern portion of the wilderness area, approximately 8 mi (13 km) from the SEZ, south of the Palen Dunes Drive interchange on I-10. At approximately 1,900 ft (530 m), the viewpoint elevation is about 1,700 ft (520 m) above the elevation of the valley floor. The visualization suggests that from this elevated viewpoint, the SEZ would be too large to be encompassed in one view, and viewers would need to turn their heads to scan across the whole SEZ; however, the angle of view is low enough that the valley floor would appear as a band across the base of the mountains. Because solar facilities in the valley would be viewed from a low oblique angle, the visible surface area of the facilities would be reduced, the strong regular geometry of the collector/reflector arrays would be less apparent, and associated visual impacts would be reduced in proportion.

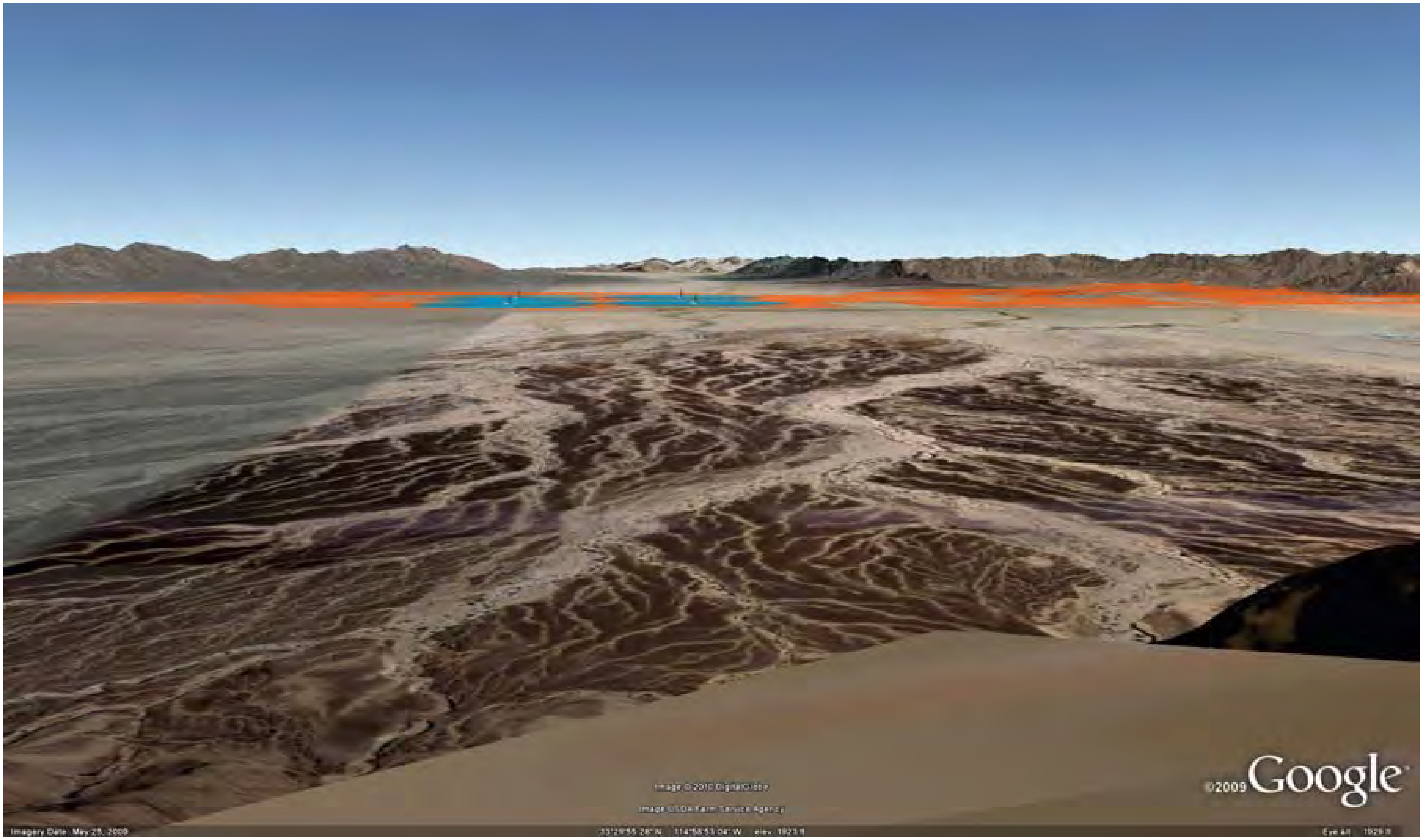

FIGURE 9.4.14.2-12 Google Earth Visualization of the Proposed Riverside East SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from a Peak in Eastern Portion of Little Chuckwalla Mountains WA

At the 80% development scenario analyzed in this PEIS, a large portion of the Chuckwalla Valley north of I-10 visible from this location would be occupied by a variety of solar facilities with associated transmission facilities and roads, stretching across the valley floor to the base of the bajada of the Palen Mountains and to the other mountain ranges north of the SEZ. While the tops of solar collector/reflector arrays located within the SEZ nearest to this viewpoint might be visible, solar collector/reflector arrays within most of the SEZ visible from this viewpoint would be seen nearly edge-on, reducing their apparent size and repeating the line of the horizon, which would tend to reduce visual contrast.

Taller ancillary facilities, such as buildings, transmission structures, and cooling towers, and plumes (if present) could potentially be visible projecting above the collector/reflector arrays. The ancillary facilities could create form and line contrasts with the strongly horizontal, regular, and repeating forms and lines of the collector/reflector arrays.

Power tower receivers within the SEZ could be visible as dim to bright points of light across almost the entire northern horizon, against the backdrop of the Palen Mountains and the other ranges north of the SEZ. At night, if sufficiently tall, the power towers could have red or white flashing hazard navigation lights that would likely be visible from the WA, and could be seen from this viewpoint.

Despite the low angle of view and considerable distance from many portions of the SEZ, the SEZ occupies such a large area within the view from this location that solar development within the SEZ under the 80% development scenario would be likely to create strong visual contrasts with the surrounding landscape that could dominate the views from this location, especially toward the northeast, where a larger portion of the SEZ is visible at a relatively shorter distance.

Figure 9.4.14.2-13 is a Google Earth visualization of the SEZ as seen from a two-track road on the bajada at the base of the northern slopes of the Little Chuckwalla Mountains in the northeastern portion of the wilderness area, approximately 6.4 mi (10.3 km) from the SEZ, southwest of the Palen Dunes Drive interchange on I-10. The viewpoint elevation is approximately 660 ft (200 m), about 300 ft (90 m) above the valley floor. In this case, the viewpoint is somewhat closer to the SEZ than that for the view shown in Figure 9.4.14.2-12, but the elevation is much lower, significantly decreasing the angle of view. The visualization suggests that from this viewpoint, the SEZ would be too large to be encompassed in one view, and viewers would need to turn their heads to scan across the whole SEZ; however, the angle of view is low enough that solar facilities in the valley would be viewed nearly edge-on, so the visible surface area of the facilities would be reduced, the

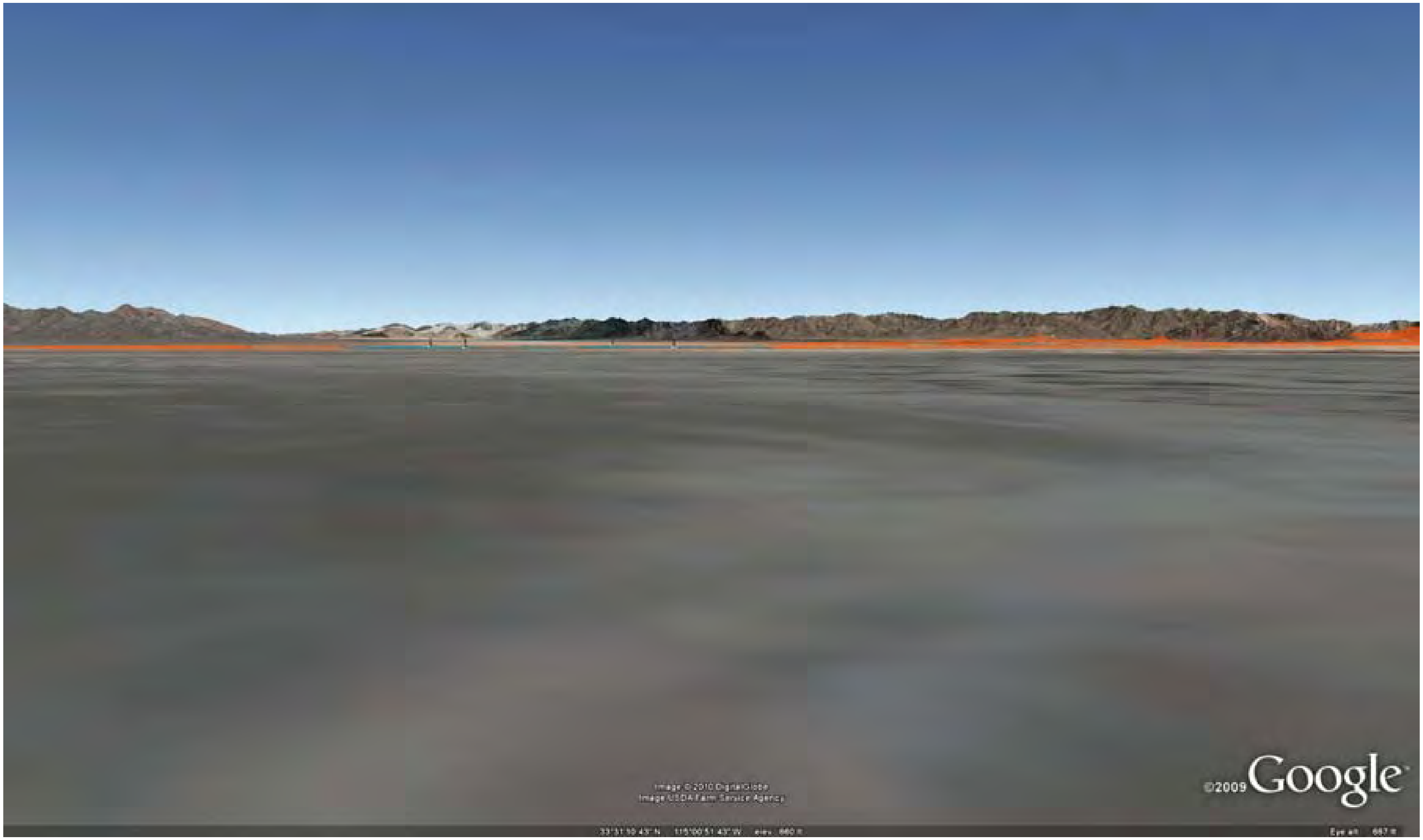

FIGURE 9.4.14.2-13 Google Earth Visualization of the Proposed Riverside East SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from a Road on the Bajada in Little Chuckwalla Mountains WA

strong regular geometry of the collector/reflector arrays would be less apparent, and associated visual impacts would be reduced in proportion.

From this relatively low viewpoint, the tops of solar collector/reflector arrays located within the SEZ would not likely be visible, but power block facilities, transmission towers, steam plumes, and other tall facility components would likely project above collector/reflector arrays, adding short vertical lines to the strongly horizontal landscape, and adding some visual contrast. Power tower receivers within the SEZ could be visible as dim to bright points of light across almost the entire northern horizon, against the backdrop of the Palen Mountains and the other ranges north of the SEZ.

Visual contrasts observed from this low-elevation location would be expected to be lower than those from more elevated viewpoints at the same or somewhat longer distances from the SEZ. At the 80% development scenario analyzed in this PEIS, a variety of solar facilities with associated transmission and roads would appear to stretch across the valley floor across nearly the entire northern horizon and to the base of the bajada of the Palen Mountains and to the other mountain ranges north of the SEZ. Resulting visual contrasts would likely be strong.

Because of the southwest-to-northeast orientation of the wilderness area, viewpoints in the southwestern portion of the wilderness area are 10 to 14 mi (16 to 23 km) from the SEZ. From some locations in the southwest portion of the wilderness area, particularly at lower elevations, nearby mountain ridges screen portions of the SEZ to the extent that expected visual contrasts associated with solar facilities visible within the SEZ would be moderate.

- *Orocopia Mountains WA*—The 54,709-acre (221-km^2) Orocopia Mountains is a congressionally designated wilderness area located 13 mi (21 km) at the point of closest approach southwest of the SEZ. The wilderness area provides dramatic scenery, with open valleys, ridges, and highly colorful and dramatically eroded canyons.

  The SEZ is visible from both the low mountains in the far northeast portion of the wilderness area and the higher mountains closer to the center of the wilderness area. Portions of the wilderness area within the 650-ft (198.1-m) SEZ viewshed (approximately 2,251 acres [9 km^2], or 4% of the total WA acreage) extend from the point of closest approach to approximately 15.7 mi (25.3 km) from the SEZ. Portions of the wilderness area within the 24.6-ft (7.5-m) viewshed encompass approximately 1,409 acres (6 km^2), or 3% of the total wilderness area acreage.

  From the far northeastern section of the WA, the SEZ is visible beyond I-10 through the western end of the Chuckwalla Valley. The distance to the SEZ exceeds 13 mi (21 km), so the angle of view is low. Parts of the SEZ are screened by the Eagle Mountains and the Chuckwalla Mountains, so the SEZ occupies a small portion of the horizontal field of view. Solar collector/reflector arrays within the SEZ that were visible from the wilderness area would be seen edge-on, reducing their apparent size, concealing their strong regular geometry, and repeating the line of the horizon, which would tend to reduce visual contrast. Power towers within the SEZ could be visible as distant points of light on the northeast horizon, against the backdrop of the Chuckwalla Valley floor or the mountain ranges northeast of the valley. At night, if sufficiently tall, the power towers could have red or white flashing hazard navigation lights that would likely be visible from the wilderness area.

The mountains closer to the center of the wilderness area, while higher, are more than 20 mi (36 km) distant from the SEZ, and in some areas, uplands in the northeast portion of the Orocopia Mountains themselves provide additional screening of the SEZ. Because of the additional distance to the SEZ and (in some areas) the additional screening, the SEZ occupies an even smaller portion of the field of view, with weaker visual contrasts expected as a result.

Visual contrasts associated with solar energy development within the SEZ would depend on viewer location within the wilderness area; the numbers, types, sizes and locations of solar facilities in the SEZ and on other project- and site-specific factors. Where there was a clear view of the SEZ, under the 80% development scenario analyzed in this PEIS, weak levels of visual contrast would be expected. The highest contrast levels would be expected for locations in the far northeastern part of the wilderness area, with lower contrasts expected for locations in the more central mountains in the wilderness area.

- *Palen-McCoy WA*—Palen-McCoy is a 224,414-acre (908-km^2) congressionally designated wilderness area located adjacent to both the northern boundary and eastern boundary of the western portion of the SEZ. The wilderness area contains five separate mountain ranges separated by wide bajadas and encompasses several landscape types, from desert pavement, bajadas, interior valleys, and canyons to dense ironwood forests, steep canyons, and rugged peaks. Unlike most other wilderness areas around the proposed SEZs, in some areas the Palen-McCoy WA extends well beyond the mountains down the bajada and as much as 7 mi (12 km) or more out onto the Chuckwalla Valley floor. Camping, hiking, backpacking, horseback riding, hunting, and wildlife viewing are recreational activities in the wilderness area.

  Much of the SEZ is visible from the various portions of this large wilderness area. The SEZ essentially surrounds the wilderness area on all sides except north (the north side of the wilderness area faces the Iron Mountain SEZ). Portions of the wilderness area within the 650-ft (198.1-m) SEZ viewshed (approximately 170,660 acres [691 km^2], or 76% of the total wilderness area acreage) extend from adjacent to the SEZ at the northeast corner of the western portion to approximately 7.6 mi (12.2 km) from the SEZ. Portions of the wilderness area within the 24.6-ft (7.5-m) viewshed encompass approximately 151,549 acres (613 km^2), or 68% of the total wilderness area acreage.

Figure 9.4.14.2-14 is a Google Earth visualization of the SEZ as seen from an unnamed peak at the far southern end of the Palen Mountains, elevated roughly 1,900 ft (580 m) above the valley floor at the closest point within the SEZ and approximately 4.0 mi (6.5 km) from the nearest point on the boundary of the SEZ, about 5 mi (8 km) north of I-10. The view direction is south–southeast.

The visualization shows that because the wilderness area extends several miles down the bajada to the south, the SEZ boundary is substantially farther away from the mountains than would be the case for many other wilderness areas, where the wilderness area boundaries typically are located at the base of the mountain slopes. The additional distance to the SEZ means that solar facilities within the SEZ would also be several miles farther from the wilderness area than they might otherwise be, substantially reducing visual contrast levels.

The visualization also shows that from this elevated viewpoint and relatively short distance to the SEZ, the SEZ would be too large to be encompassed in one view, and viewers would need to turn their heads to scan across the whole SEZ. Two clusters of power tower facility models are visible; the left-most model cluster is approximately 15 mi (24 km) from the viewpoint, and the right-most model cluster is 8 mi (13 km) from the viewpoint (both distances to center points of model clusters). The tops of solar collector/reflector arrays in the closest parts of the SEZ likely would be visible, but the angle of view is low enough that most solar collector/reflector arrays visible in the SEZ from this location would be viewed nearly edge-on, reducing their apparent size and repeating the horizontal line of the valley plain. If power towers were present within the SEZ, at the shorter distances shown here, the receivers could appear as very bright point or nonpoint (i.e., having visible cylindrical or rectangular surfaces) light sources atop discernable tower structures against the backdrop of the valley floor. Power tower receivers located at the farther distances depicted here would likely appear as distant points of light against the backdrop of the valley floor or the bajadas of the mountains on the eastern side of the SEZ.

At night, if sufficiently tall, the power towers could have red or white flashing hazard navigation lights that likely would be visible from the WA and could be very conspicuous from this viewpoint, given the dark night skies in the vicinity of the SEZ. Other lighting associated with solar facilities in the SEZ

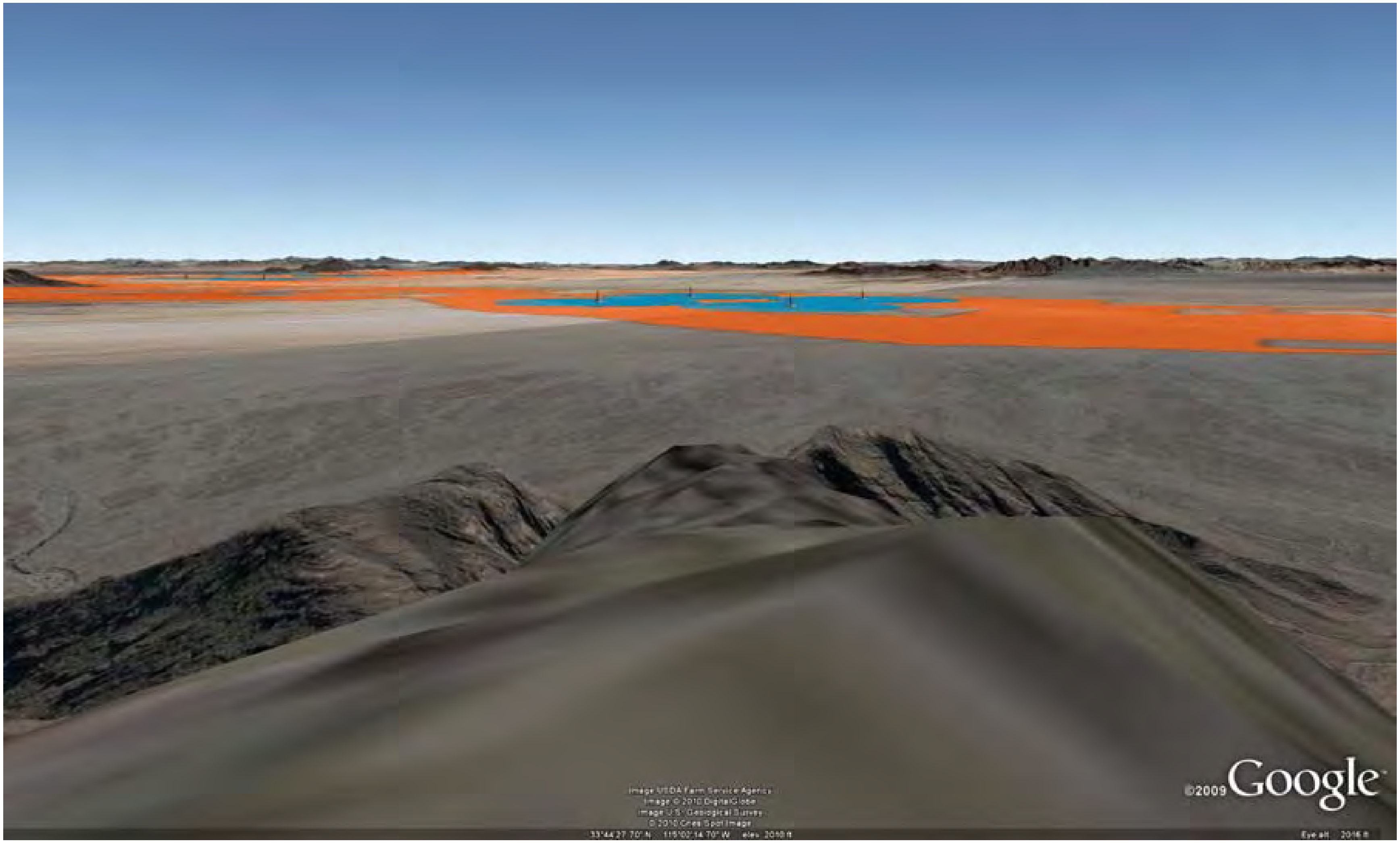

FIGURE 9.4.14.2-14 Google Earth Visualization of the Proposed Riverside East SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from a Peak in Southern Palen-McCoy WA

could potentially be visible as well, at least for facilities in the closest portions of the SEZ. The potential visual contrast expected for this viewpoint would depend on the numbers, types, sizes and locations of solar facilities in the SEZ and on other project- and site-specific factors, but because the viewpoint is elevated and relatively close to the SEZ, the SEZ would occupy much of the field of view. Under the 80% development scenario analyzed in this PEIS, there could be numerous solar facilities within the SEZ, a variety of technologies employed, and a range of supporting facilities that would contribute to visual impacts, such as transmission towers and lines, substations, power block components, and roads. The resulting visually complex landscape could potentially dominate the view from this location. Under the 80% development scenario, solar facilities within the SEZ would be expected to create strong visual contrasts as viewed from this location within the WA.

Figure 9.4.14.2-15 is a Google Earth visualization of the SEZ as seen from an unnamed peak on the western side of the Palen Mountains across from the Coxcomb Mountains, elevated roughly 2,300 ft (700 m) above the valley floor at the closest point within the SEZ, and approximately 3 mi (5 km) from the nearest point on the boundary of the SEZ. The view looks west to the Eagle and Coxcomb Mountains in Joshua Tree NP.

The visualization shows that the wilderness area extends approximately 1.5 mi (2.4 km) down the bajada to the west. The visualization also shows that from this elevated viewpoint and relatively short distance to the SEZ, the SEZ would be too large to be encompassed in one view, and viewers would need to turn their heads to scan across the whole SEZ. Two clusters of power tower facility models are visible; the left-most model cluster is approximately 8 mi (13 km) from the viewpoint, and the right-most model cluster is 9.5 mi (15 km) from the viewpoint (both distances to center points of model clusters). The tops of solar collector/reflector arrays in the closest parts of the SEZ would likely be visible, but the angle of view is low enough that solar collector/reflector arrays visible in the farthest part of the SEZ visible from this location would be viewed nearly edge-on, reducing their apparent size, tending to conceal their strong regular geometry, and repeating the horizontal line of the valley plain.

Taller ancillary facilities, such as buildings, transmission structures, and cooling towers, and plumes (if present) likely would be visible projecting above the collector/reflector arrays, and their structural details could be evident, at least for nearby facilities. The ancillary facilities could create form and line contrasts with the strongly horizontal, regular, and repeating forms and lines of the collector/reflector arrays. Color and texture contrasts would also be likely, but their extent would depend on the materials and surface treatments utilized in the facilities.

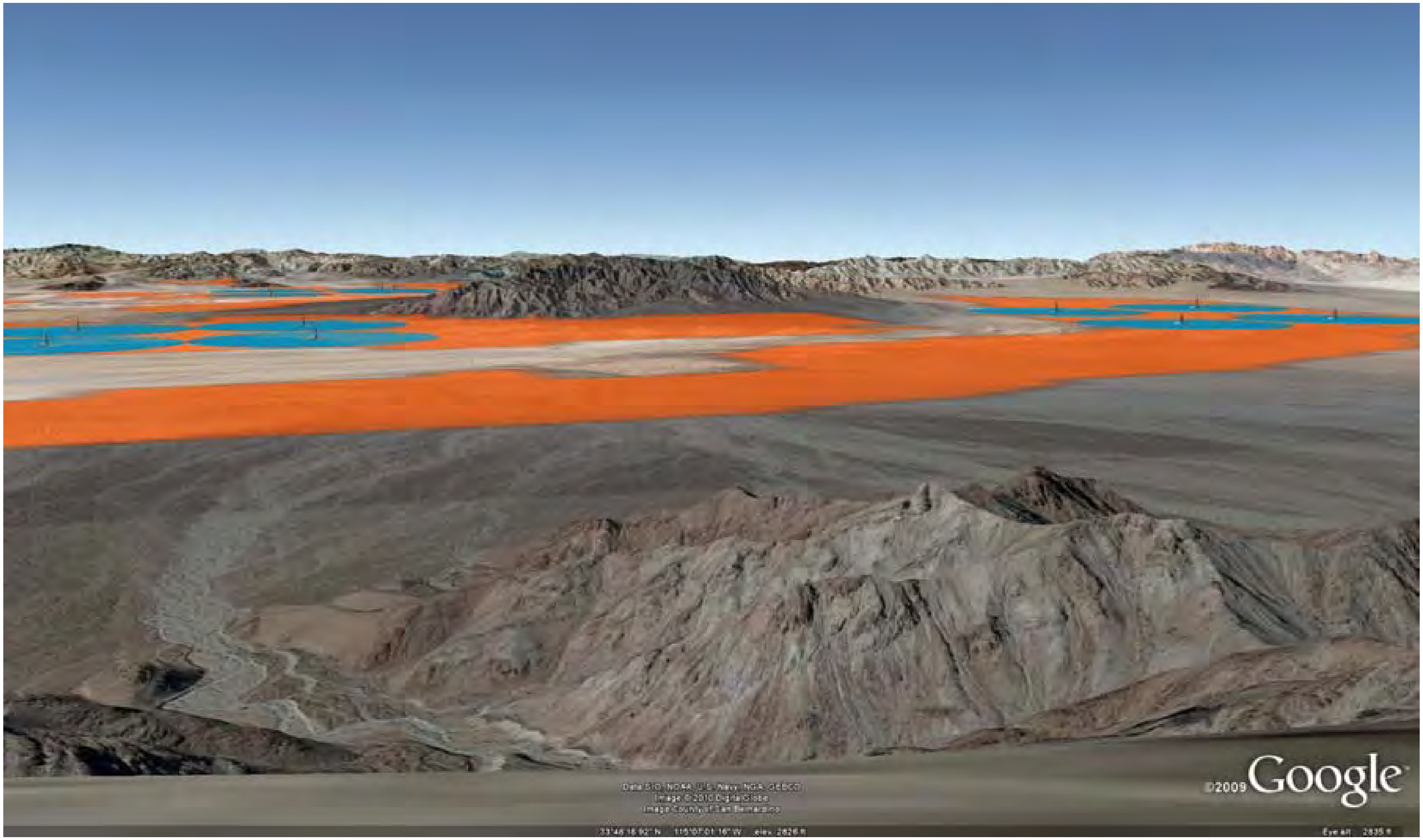

FIGURE 9.4.14.2-15 Google Earth Visualization of the Proposed Riverside East SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from a Peak in Western Palen-McCoy WA

If power towers were present within the SEZ, at the shorter distances shown here, the receivers could appear as very bright white light sources atop clearly discernable tower structures against the backdrop of the valley floor. Power tower receivers located at the farther distances depicted here would likely appear as distant points of light against the backdrop of the valley floor or the bajadas of the Eagle Mountains.

At night, if sufficiently tall, the power towers could have red or white flashing hazard navigation lights that could be conspicuous from this viewpoint, given the dark night skies in the vicinity of the SEZ. Other lighting associated with solar facilities in the SEZ could potentially be visible as well, at least for facilities in the closest portions of the SEZ.

The potential visual contrast expected for this viewpoint would depend on the numbers, types, sizes, and locations of solar facilities in the SEZ and on other project- and site-specific factors, but because the viewpoint is elevated and relatively close to the SEZ, the SEZ would occupy much of the field of view. Under the 80% development scenario analyzed in this PEIS, there could be numerous solar facilities within the SEZ, a variety of technologies employed, and a range of supporting facilities that would contribute to visual impacts, such as transmission towers and lines, substations, power block components, and roads. The resulting visually complex landscape could potentially dominate the view from this location. Under the 80% development scenario, solar facilities within the SEZ would be expected to create strong visual contrasts as viewed from this location within the wilderness area.

Figure 9.4.14.2-16 is a Google Earth visualization of the SEZ as seen from an unpaved road on the bajada in the far southeastern portion of the wilderness area. The viewpoint is elevated about 130 ft (40 m) above the valley floor at the closest point within the SEZ, and is approximately 3 mi (5 km) from the nearest point on the boundary of the SEZ. The view looks southwest to the Little Chuckwalla Mountains beyond I-10.

The SEZ in the vicinity of this viewpoint is only 3.5 (5.6 km) across, northeast to southwest, and because the elevation of the viewpoint is only minimally elevated relative to the SEZ, the SEZ and heliostat arrays depicted in the power tower model cluster appear edge-on, as a very narrow band parallel to, and repeating, the strong horizon line and thus greatly reducing their visible area and associated visual contrast. The model is approximately 5 mi (8 km) from the viewpoint. The visualization also shows that from this elevated viewpoint and relatively short distance to the SEZ, the SEZ would be too large to be encompassed in one view, and viewers would need to turn their heads to scan across the whole SEZ, which would span the entire southern horizon. If power towers were present within the SEZ, at the distance shown here, the receivers could appear as very bright point light sources atop clearly

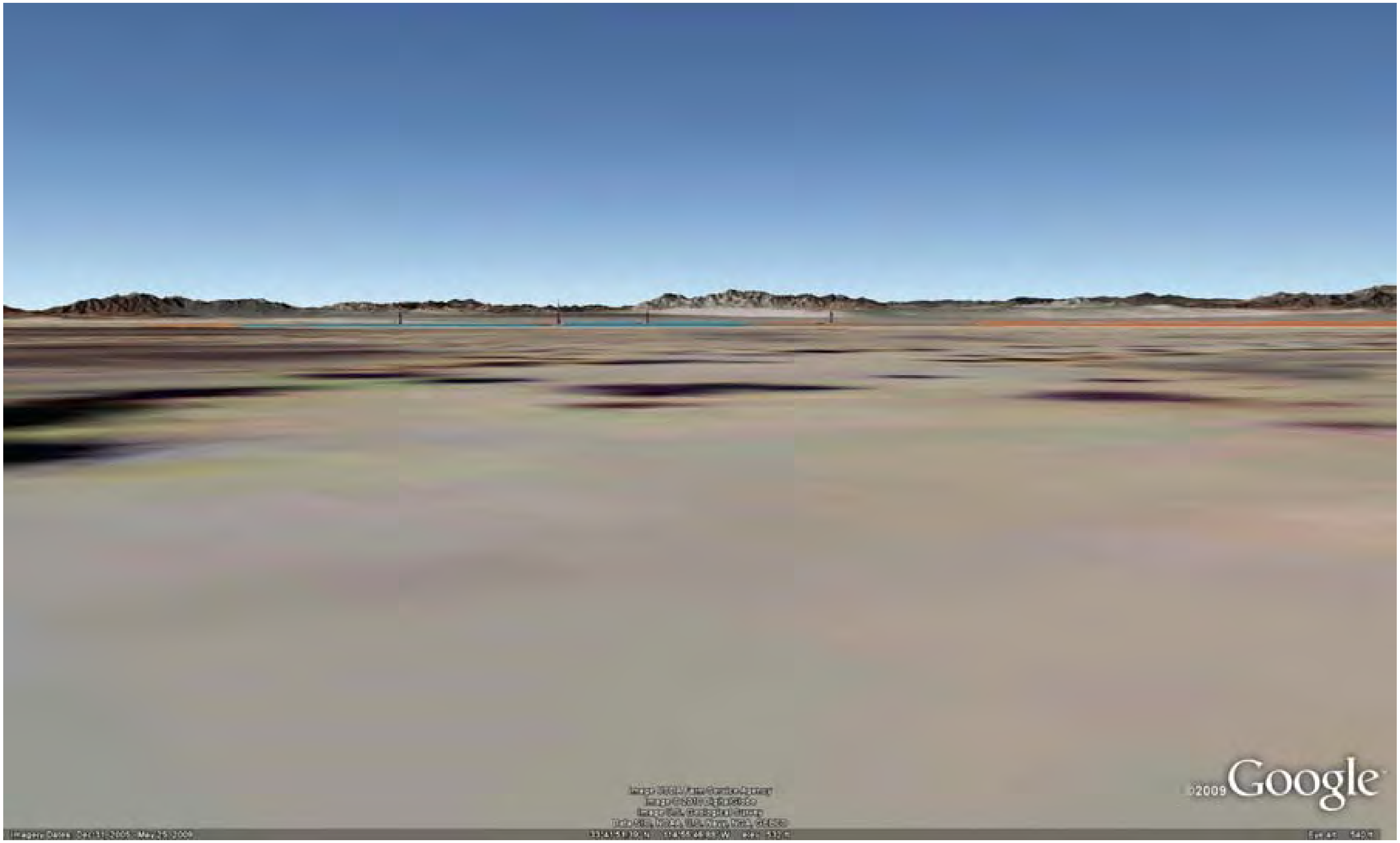

FIGURE 9.4.14.2-16 Google Earth Visualization of the Proposed Riverside East SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from a Road on the Bajada in Palen-McCoy WA

discernable tower structures against the backdrop of the Little Chuckwalla Mountains. Transmission towers would be visible above the solar collector/reflector arrays. Plumes from CSP plants could be visible above the collector/reflector arrays, depending on lighting and atmospheric conditions, as could be the tops of ancillary buildings. Glare and glinting might be possible from the sides of collector/reflector arrays.

The potential visual contrast expected for this viewpoint would vary depending on project locations, technologies, and site designs. Under the 80% development scenario, solar facilities within the SEZ would be expected to create weak to moderate visual contrasts as viewed from this location within the wilderness area.

In summary, the Palen-McCoy WA is very large and, unlike most wilderness areas, includes much gently sloping low-elevation land beyond the mountains; this would have the effect of keeping solar facilities within the SEZ away from many of the higher elevation viewpoints in the wilderness area. Nonetheless, virtually the entire SEZ is visible from the various portions of the wilderness area, and while perceived contrast levels would depend on viewer location within the wilderness area, and on the numbers, types, sizes, and locations of solar facilities in the SEZ, as well as on other project- and site-specific factors, many higher elevation viewpoints within the wilderness area could be subject to strong visual contrasts from solar energy development within the SEZ under the 80% development scenario.

Note that some locations within the wilderness area also have partial views of the proposed Iron Mountain SEZ, in the Ward Valley north of the wilderness area. Where views of both SEZs exist, additional impacts to those described here would occur.

- *Palo Verde Mountains WA*—The 30,403-acre (123-km^2) Palo Verde Mountains WA is a congressionally designated wilderness area located 6.2 mi (10.0 km) at the point of closest approach south of the SEZ. The wilderness area includes twin buttes known as the Flat Tops, which stand out as a landmark against a range of jagged peaks. Palo Verde Peak is the high point of the range, rising to 1,800 ft (550 m).

  The southeastern portion of the SEZ is visible from higher elevations throughout all but the southwestern portion of the wilderness area. Portions of the wilderness area within the 650-ft (198.1-m) SEZ viewshed (approximately 13,252 acres [54 km^2], or 43.6% of the total wilderness area acreage) extend from the point of closest approach to approximately 14.3 mi (23.0 km) from the SEZ. Portions of the wilderness area within the 24.6-ft (7.5-m) viewshed encompass approximately 8,715 acres (35 km^2), or 29% of the total wilderness area acreage.

Figure 9.4.14.2-17 is a Google Earth visualization of the SEZ as seen from Milpitas Wash Road, along the border of the northwestern portion of the wilderness area, approximately 8 mi (13 km) from the closest point in the SEZ, just west of the Mule Mountains. The viewpoint elevation is about 30 ft (10 m) above the elevation of the closest point in the SEZ. The visualization suggests that minor undulations in elevation between the viewpoint and the SEZ would screen portions of the SEZ from view and that the Mule Mountains would also partially screen views of the SEZ. The SEZ occupies a substantial portion of the horizontal field of view, but the angle of view is very low. Solar collector/reflector arrays within the SEZ visible from the wilderness area would be seen edge-on, reducing their apparent size and repeating the line of the horizon, which would tend to reduce visual contrast.

Taller ancillary facilities, such as buildings, transmission structures, and cooling towers, and plumes (if present) could potentially be visible projecting above the collector/reflector arrays, at least for nearby facilities. The ancillary facilities could create form and line contrasts with the strongly horizontal, regular, and repeating forms and lines of the collector/reflector arrays.

Power towers within the SEZ could be visible as points of light on the northeast horizon, against the backdrop of the Big Maria Mountains. At night, if sufficiently tall, the power towers could have red or white flashing hazard navigation lights that likely would be visible from the wilderness area and could be conspicuous from this viewpoint, given the dark night skies in the vicinity of the SEZ. Other lighting associated with solar facilities in the SEZ could potentially be visible as well, at least for facilities in the closest portions of the SEZ.

Figure 9.4.14.2-18 is a Google Earth visualization of the SEZ as seen from Palo Verde Peak, in the far southeastern portion of the wilderness area, approximately 13 mi (21 km) from the far southeastern corner of the SEZ, just east of the Mule Mountains. At 1,800 ft (550 m), the viewpoint elevation is about 1,400 ft (430 m) above the elevation of the closest point in the SEZ. The visualization suggests that while the Mule and Little Chuckwalla Mountains would partially screen views of the SEZ, because of its vast size the SEZ would stretch across most of the horizontal field of view. Despite the height of the viewpoint, the angle of view is very low, because the distance to the SEZ exceeds 13 mi (21 km). Solar collector/reflector arrays within the SEZ visible from this viewpoint would be seen edge-on, reducing their apparent size and repeating the line of the horizon, which would tend to reduce visual contrast. Power towers within the SEZ could be visible as distant points of light on the northern and northwestern horizon, against the backdrop of the Big Maria Mountains and the other ranges north of the SEZ. At night, if sufficiently tall, the power towers could have red or white flashing hazard navigation lights that could be visible from this viewpoint.

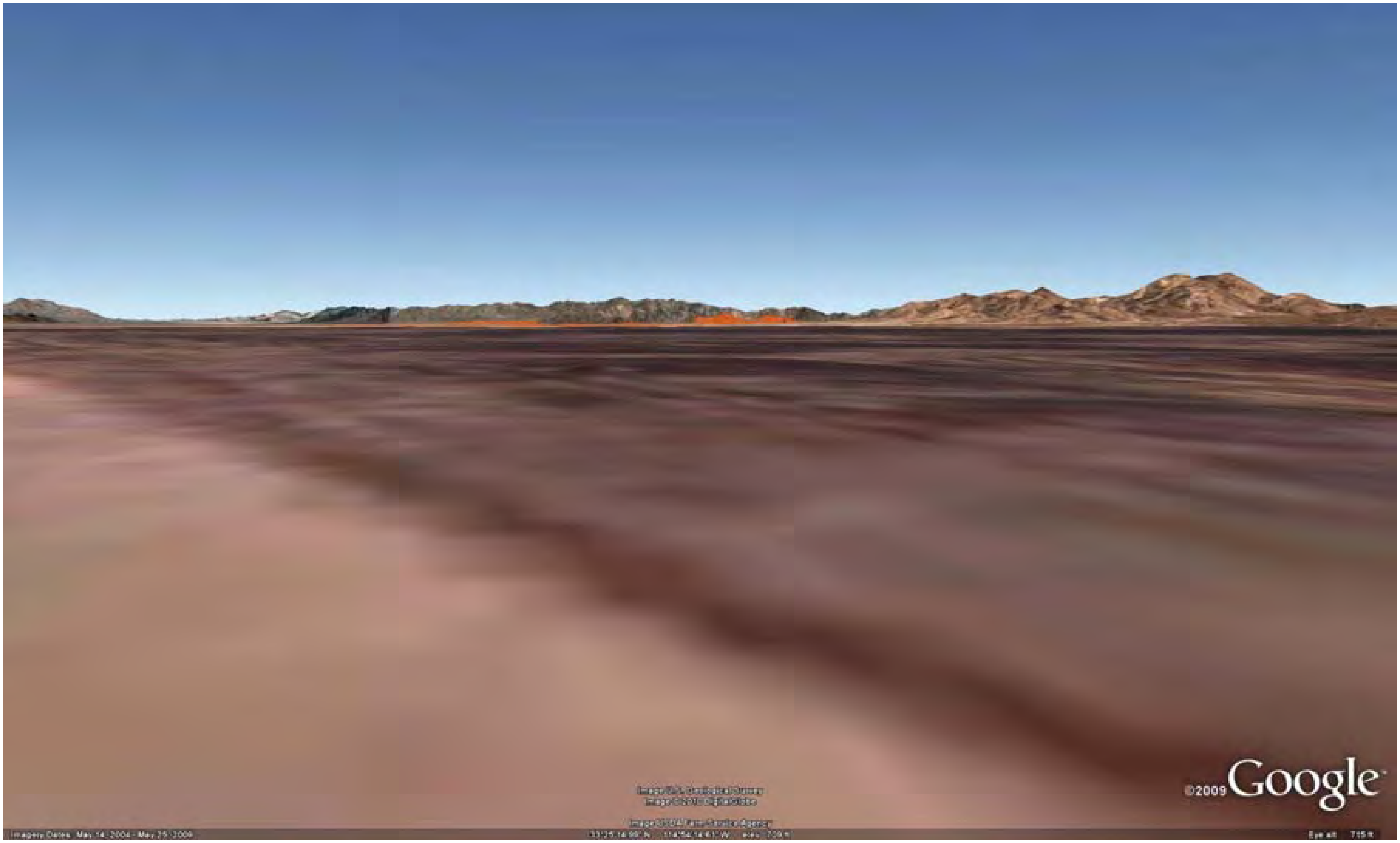

FIGURE 9.4.14.2-17 Google Earth Visualization of the Proposed Riverside East SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Milpitas Wash Road in the Palo Verde Mountains WA

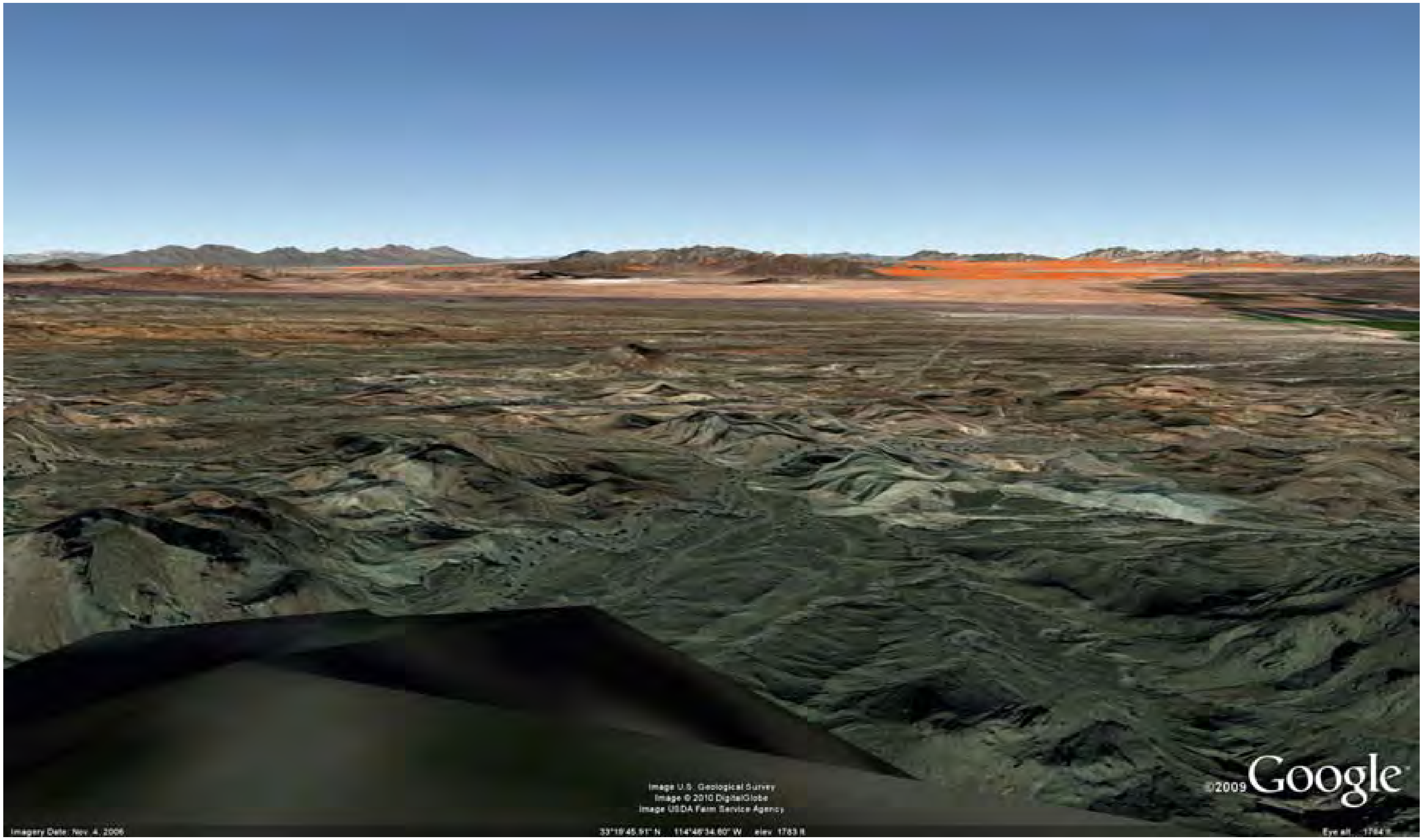

FIGURE 9.4.14.2-18 Google Earth Visualization of the Proposed Riverside East SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from Palo Verde Peak in the Palo Verde Mountains WA

Visual contrasts associated with solar energy development within the SEZ would depend on viewer location within the wilderness area; on the numbers, types, sizes and locations of solar facilities in the SEZ; and on other project- and site-specific factors. At lower elevations, where there is a clear view of the SEZ, under the 80% development scenario analyzed in this PEIS, weak levels of visual contrast would be expected. Moderate levels of visual contrast might be observed from the highest elevations within the WA, such as Thumb Peak, the Flat Tops, and Palo Verde Peak.

- *Rice Valley WA*—The 43,412-acre (176-km^2) Rice Valley is a congressionally designated wilderness area located 0.5 mi (0.8 km) at the point of closest approach north of the SEZ. The WA includes a portion of the broad, flat plains of Rice Valley, the northwestern tip of the Big Maria Mountains, and a system of small dunes rising 30 to 40 feet above the valley floor. The valley is part of a massive sand sheet that extends from Cadiz Valley through Ward Valley. Camping, hiking, backpacking, hunting, and wildlife viewing are recreational activities in the wilderness area. According to BLM's 1990 Wilderness Report, the wilderness area provides expansive vistas, imparting to the visitor a sense of vastness and desolation. The flatness of most of the area provides miles of unrestricted views in all directions (BLM 1990).

  Portions of the wilderness area within the 650-ft (198.1-m) SEZ viewshed (approximately 35,792 acres [145 km^2], or 82% of the total wilderness area acreage) extend from the point of closest approach to approximately 9.9 mi (15.9 km) from the SEZ. Portions of the wilderness area within the 24.6-ft (7.5-m) viewshed encompass approximately 871 acres (4 km^2), or 2% of the total wilderness area acreage. As noted above, the wilderness area includes a portion of the Big Maria Mountains, and the range forms the southern boundary of the wilderness area. The large difference in visible area within the wilderness area between the 650-ft (198.1-m) and the 24.6-ft (7.5-m) viewsheds is due to inclusion in the SEZ of two hills located in the far northeastern portion of the SEZ south of the wilderness area and the Big Maria Mountains. If 650-ft (198.1-m) power towers were located at the peaks of these hills, the upper portions of the power tower would project above the bottoms of two gaps in the Big Maria Mountains such that they would be visible from much of the Rice Valley WA. However, due to the steep slope of the hills, it is extremely unlikely that power towers would ever be erected on the peaks of these hills. If power towers were located away from the peaks of these hills, they would not be visible from points in the wilderness area north of the Big Maria Mountains. The rest of the analysis assumes that visibility of solar facilities within the SEZ is limited to the southern slopes of the Big Maria Mountains within the wilderness area.

  With this assumption, solar energy facilities within the SEZ could potentially be visible from a small area in the far southern portion of the wilderness area, including peaks and south-facing slopes of certain mountains in the Big Maria range.

Figure 9.4.14.2-19 is a Google Earth visualization of the SEZ (highlighted in orange) as seen from a peak in the Big Maria Mountains in the far southern portion of the wilderness area. The viewpoint is approximately 1.4 mi (2.3 km) from the northern border of the SEZ and elevated approximately 1,750 ft (533 m) above the valley floor at the closest point in the SEZ. The view looks southward down the length of the eastern portion of the SEZ toward the distant McCoy and Mule Mountains.

The visualization suggests that from this elevated viewpoint and relatively short distance to the SEZ, the SEZ would be too large to be encompassed in one view, and viewers would need to turn their heads to scan across the whole visible portion of the SEZ. Four clusters of power tower facility models are visible; the closest model cluster is 4.2mi (6.8 km) from the viewpoint, and the farthest model cluster is 14 mi (23 km) from the viewpoint (both distances to center points of model clusters). The tops of solar collector/reflector arrays in the closest parts of the SEZ would be visible, but the angle of view is low enough that farther facilities would likely repeat the horizontal line of the valley plain.

Taller ancillary facilities, such as buildings, transmission structures, and cooling towers, and plumes (if present) would likely be visible projecting above the collector/reflector arrays, and their structural details could be evident, at least for nearby facilities. The ancillary facilities could create form and line contrasts with the strongly horizontal, regular, and repeating forms and lines of the collector/reflector arrays. Color and texture contrasts would also be likely, but their extent would depend on the materials and surface treatments utilized in the facilities.

If power towers were present within the SEZ, at short distances the receivers would likely appear as very bright nonpoint sources of light atop clearly discernable tower structures against the backdrop of the valley floor, while at the longest distances visible here they would likely appear as distant points of light below the southern horizon against the backdrop of the valley floor.

At night, if sufficiently tall, the power towers could have red or white flashing hazard navigation lights that would likely be visible from the WA, and could be very conspicuous from this viewpoint, given the dark night skies in the vicinity of the SEZ. Other lighting associated with solar facilities in the SEZ could potentially be visible as well, at least for facilities in the closest portions of the SEZ.

The potential visual contrast expected for this viewpoint would depend on the numbers, types, sizes, and locations of solar facilities in the SEZ and on other

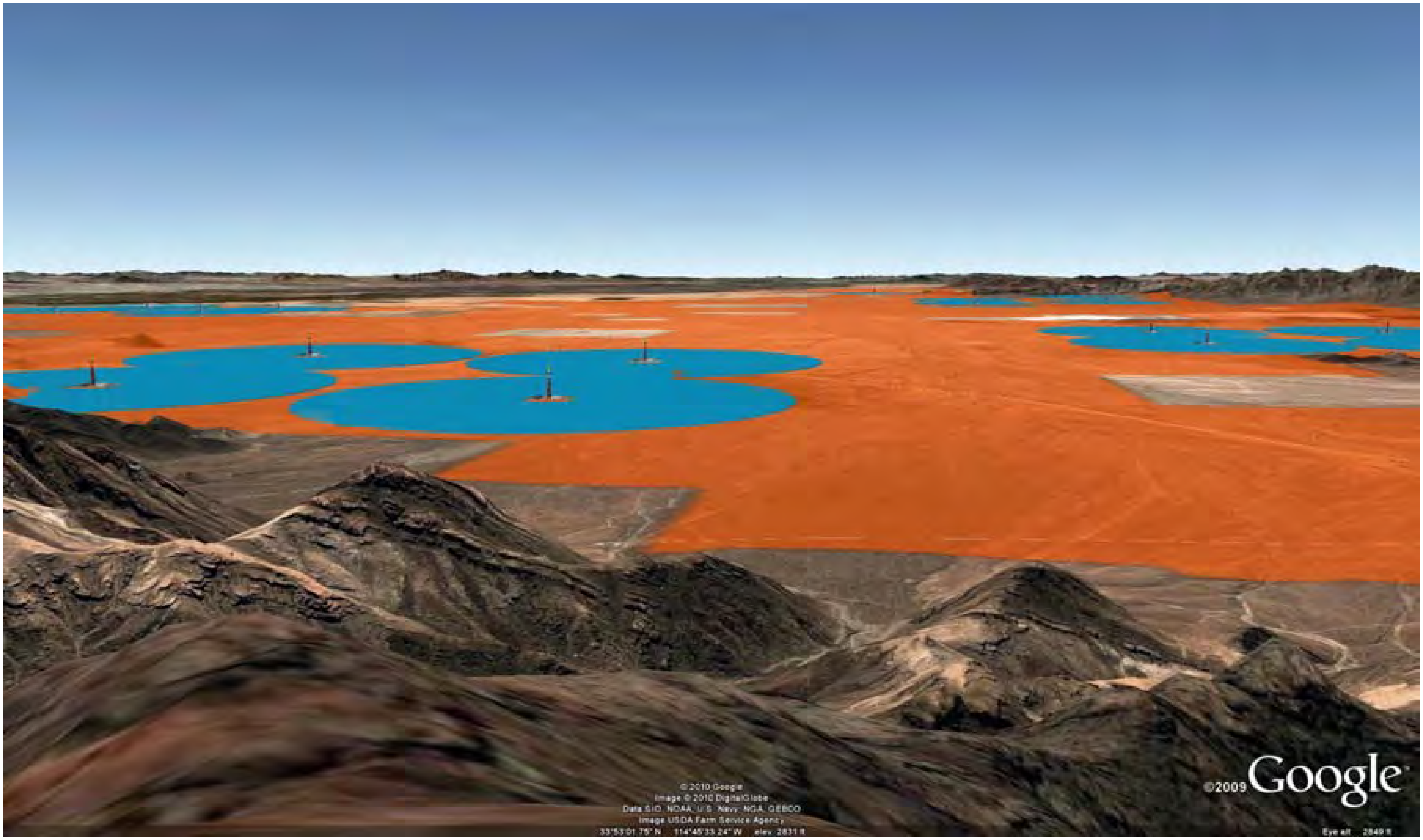

FIGURE 9.4.14.2-19 Google Earth Visualization of the Proposed Riverside East SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from a Viewpoint in the Big Maria Mountains within the Rice Valley WA

project- and site-specific factors, but because the viewpoint is elevated and relatively close to the SEZ, the SEZ would fill up much of the field of view. While one or a few solar facilities within the SEZ might only give rise to moderate levels of visual contrast, under the 80% development scenario analyzed in this PEIS, there could be numerous solar facilities within the SEZ, a variety of technologies employed, and a range of supporting facilities that would contribute to visual impacts, such as transmission towers and lines, substations, power block components, and roads. The lack of uniformity in facility components could result in a visually complex landscape, vast in scope but with low visual unity. This essentially industrial-appearing landscape would contrast greatly with the surrounding natural-appearing lands and would likely dominate the view from this location. Under the 80% development scenario, solar facilities within the SEZ would be expected to create strong visual contrasts as viewed from this and similar locations on the slopes or peaks of the Big Maria Mountains within the wilderness area.

Note that some locations within the Big Maria Mountains and within the wilderness area also have partial views of the more distant proposed Iron Mountain SEZ. Overall, under the 80% development scenario analyzed in this PEIS, solar energy development in the Iron Mountain SEZ would be expected to result in much weaker visual impacts on the wilderness area than those expected from development in the Riverside East SEZ, but where views of both SEZs existed, additional impacts to those described here would occur.

- *Sheephole Valley WA*—The 195,002-acre (789-km^2) Sheephole Valley is a congressionally designated wilderness area located 12.3 mi (19.8 km) at the point of closest approach northwest of the SEZ. The wilderness area includes the Sheephole Mountains, the Calumet Mountains, and the Sheephole Valley. The Sheepholes are a steep, boulder-strewn mountain range; the Calumets are similar but much lower. Camping, hiking, backpacking, hunting, and wildlife viewing are recreational activities in the wilderness area.

  The SEZ is visible from higher elevations in both the Sheephole and Calumet Mountains. Portions of the wilderness area within the 650-ft (198.1-m) SEZ viewshed (approximately 2,733 acres [11 km^2], or 1.4% of the total wilderness area acreage) extend from 14.4 mi (23.2 km) to approximately 22.6 mi (36.4 km) from the SEZ. Portions of the wilderness area within the 24.6-ft (7.5-m) viewshed encompass approximately 625 acres (3 km^2) or 0.3% of the total wilderness area acreage.

  From the Sheephole Mountains, the far northwest portion of the SEZ is visible beyond the Pinto Basin to the west of the Coxcomb Mountains. The Coxcomb Mountains partially screen the view of the SEZ from the Sheephole Mountains, and because the distance to the SEZ exceeds 15 mi (24 km), the angle of view is low, so that the visible portion of the SEZ occupies a very small portion of the field of view. Solar collector/reflector arrays within the

SEZ visible from the Sheephole Mountains within the wilderness area would be seen edge-on, reducing their apparent size and repeating the line of the horizon, which would tend to reduce visual contrast. Power towers within the SEZ could be visible as distant points of light on the southeast horizon, against the backdrop of the Chuckwalla Valley floor. At night, if sufficiently tall, the power towers could have red or white flashing hazard navigation lights that could potentially be visible from this location. Expected visual contrasts would be weak.

From the Calumet Mountains, sufficiently tall power towers in the northwest portion of the SEZ east of the Coxcomb Mountains might just be visible over the bajada of the Coxcomb Mountains. The mountains screen the view of the SEZ from the Calumet Mountains, and because the distance to the SEZ exceeds 19 mi (31 km), the angle of view is very low, so only the upper portions of tall power towers might be seen. Power towers within the SEZ could be visible as distant points of light on the southeast horizon, appearing just above the bajada east of the Coxcomb Mountains. Expected visual contrasts would be minimal.

- *Trigo Mountains WA*—The 30,046-acre (122-km^2) Trigo Mountains is a congressionally designated wilderness area located in Arizona, 17.4 mi (28.0 km) at the point of closest approach southeast of the SEZ. The wilderness is characterized by sawtooth ridges and steep-sided canyons and is heavily dissected by washes. Recreation such as extended horseback riding and backpacking trips, sightseeing, hiking, and rock climbing are enhanced by the topographic diversity, scenic character, as well as botanical, wildlife, and cultural values (BLM 2010a).

  The Riverside East SEZ is visible from higher elevations throughout the Trigo wilderness area. Although the closest points in the wilderness area are father than 17 mi (27 km) from the SEZ, there are no intervening mountains to screen views. Portions of the wilderness area within the 650-ft (198.1-m) SEZ viewshed (approximately 3,512 acres [14.2 km^2], or 12% of the total wilderness area acreage) extend from the point of nearest approach to beyond 25 mi (41 km) from the SEZ. Portions of the wilderness area within the 24.6-ft (7.5-m) viewshed encompass approximately 2,517 acres (10 km^2), or 8% of the total wilderness area acreage.

  Figure 9.4.14.2-20 is a Google Earth visualization of the SEZ as seen from an unnamed peak in the northwestern portion of the wilderness area, approximately 19 mi (31 km) from the far southeastern portion of the SEZ. The visualization illustrates that despite the relatively long distance to the SEZ from the Trigo Mountains WA, because of the open view and its large size, the SEZ occupies a substantial portion of the horizontal field of view. Because of the long distance, however, the angle of view is very low. Solar collector/reflector arrays within the SEZ visible from the wilderness area

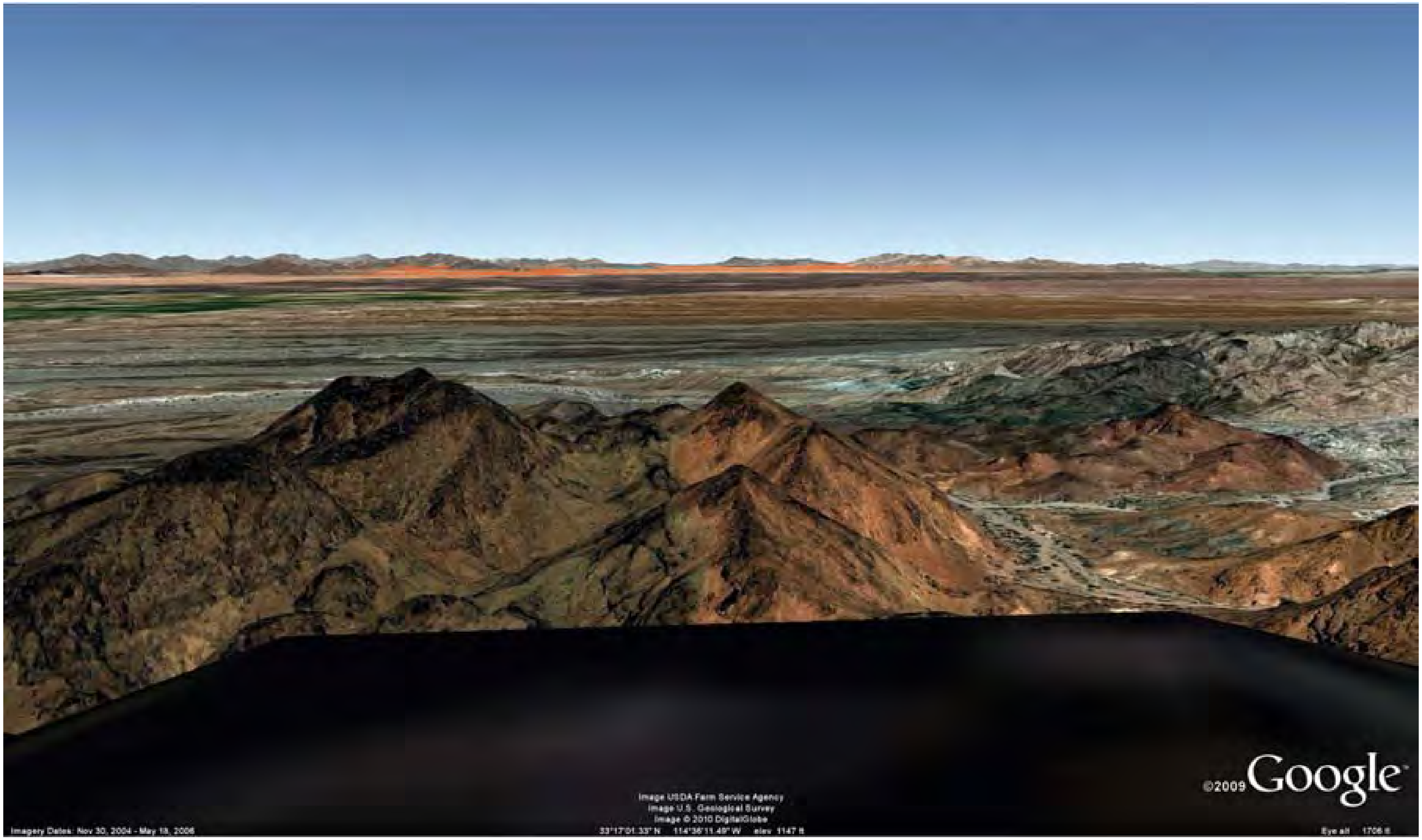

FIGURE 9.4.14.2-20 Google Earth Visualization of the Proposed Riverside East SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from a Viewpoint in the Trigo Mountains within the Trigo Mountains WA

would be seen edge-on, reducing their apparent size and repeating the line of the horizon, which would tend to reduce visual contrast. Power towers within the SEZ could be visible as distant points of light on the northwest horizon, against the backdrop of the Chuckwalla Valley floor or the mountain ranges north of the valley. At night, if sufficiently tall, the power towers could have red or white flashing hazard navigation lights that could be visible from the WA.

Visual contrasts associated with solar energy development within the SEZ would depend on the numbers, types, sizes and locations of solar facilities in the SEZ, and other project- and site-specific factors.. Where there was a clear view of the SEZ, under the 80% development scenario analyzed in this PEIS, weak levels of visual contrast would be expected. The highest contrast levels would be expected for peaks in the northern part of the WA, with lower contrasts expected for lower elevations and viewpoints in the southern part of the WA.

- *Turtle Mountains WA*—The 182,610-acre (739-km^2) Turtle Mountains is a congressionally designated wilderness area located 17.0 mi (27.4 km) at the point of closest approach north of the SEZ. Above broad, open bajadas, the wilderness area’s eroded volcanic peaks, spires, and cliffs in a range of colors constitute a diverse, scenic landscape, which includes the Turtle Mountains scenic ACEC and the Turtle Mountains National Natural Landmark. The wilderness area contains numerous trails. The wilderness area contains the Mopah Peaks, which are rhyodactic or volcanic plugs, and the northernmost peak in the wilderness area is a landmark known as Mexican Hat. Hiking, horseback riding, hunting, camping, rock hounding, photography, and backpacking are popular recreation activities in the wilderness area. Coffin, Mopah, and Mohawk Springs are popular hiking destinations. The Turtle Mountains WA includes most of the Turtle Mountains range, and a large portion of the Ward Valley floor to the northwest of the Turtle Mountains.

  Small areas of the northeast section of the SEZ are visible from the south-facing slopes and peaks in the southern portion of the wilderness area beyond Rice Valley through two gaps, one in the Big Maria Mountains and one between the Big Maria and Little Maria Mountains. Portions of the wilderness area within the 650-ft (198.1-m) viewshed (approximately 13,827 acres [56 km^2], or 8% of the total wilderness area acreage) extend from the point of nearest approach to beyond 25 mi (41 km) from the SEZ. Portions of the wilderness area within the 24.6-ft (7.5-m) viewshed encompass approximately 1,375 acres (6 km^2), or 0.8% of the total wilderness area acreage.

  The gaps through which the SEZ is visible from the wilderness area are relatively narrow, so the visible portions of the SEZ are very small, especially the eastern-most gap in the Big Maria Mountains. The distance from the SEZ to visible areas within the wilderness area exceeds 17 mi (27 km), so solar collector/reflector arrays within the SEZ visible from the wilderness area would be seen edge-on, reducing their apparent size and repeating the line of the horizon, which would tend to reduce visual contrast. Power towers within the SEZ could be visible as distant points of light within the gaps. At night, if sufficiently tall, the power towers could have red or white flashing hazard navigation lights that could be visible from the wilderness area.

Visual contrasts associated with solar energy development within the SEZ would depend on viewer location within the WA; solar facility type, size, and location within the SEZ; and other visibility factors. Where there was a clear view of the SEZ, under the 80% development scenario analyzed in this PEIS, weak levels of visual contrast would be expected.

National Wildlife Refuges

- *Cibola NWR*—The 18,398-acre (75-km^2) Cibola NWR is 9.8 mi (15.8 km) south of the SEZ at the closest point of approach, in the floodplain of the lower Colorado River. The refuge is located immediately north of Imperial NWR (see below). The refuge includes backwaters, seasonally flooded croplands, two historic river meanders, and two small lakes. The refuge includes low desert ridges and washes away from the river.

  The southeastern portion of the SEZ is visible from most of the refuge. Approximately 17,121 acres (69 km^2), or 93% of the refuge, is within the 650-ft (198.1-m) viewshed of the SEZ, and 16,386 acres (66 km^2), or 89%, is within the 24.6-ft (7.5-m) viewshed. The portions of the refuge within the viewshed extend from the point of nearest approach at the northern boundary to the southern boundary of the refuge, approximately 22.1 mi (35.6 km) from the SEZ.

  The refuge is very flat, with relief in most of the refuge varying less than 20 ft (6 m), except the far southern portions. Most of the refuge is lower in elevation than the SEZ by 100 ft (30 m) or more, and the highest points in the refuge are lower than the southeastern portion of the SEZ; hence the angle of view between the refuge and the SEZ is very low. Some of the SEZ is screened from view by the Palo Verde Mountains. In addition, much of the refuge is heavily vegetated, and in some areas of the refuge, views of the SEZ are likely screened by vegetation.

  Any solar facilities within the SEZ visible from the refuge would be viewed at very low angles. Solar collector/reflector arrays would be viewed edge-on, tending to reduce apparent size and visual contrast. If power towers were visible, they would likely appear as point light sources on the northern horizon. At night, if sufficiently tall, the power towers could have red or white flashing hazard navigation lights that could be visible from the refuge.

Visual contrasts associated with solar energy development within the SEZ would depend on viewer location within the NWR; solar facility type, size, and location within the SEZ; and other visibility factors. From the northern portions of the NWR, where there was a clear view of the SEZ, under the 80% development scenario analyzed in this PEIS, weak levels of visual contrast would be expected. Contrast would be weaker from viewpoints in the southern portions of the NWR, because the distance to the SEZ is greater.

- *Imperial NWR*—The 31,465-acre (127-km^2) Imperial NWR is approximately 22.1 mi (35.6 km) at the closest point of approach south of the SEZ. The refuge protects wildlife habitat along 30 mi (48.3 km) of the lower Colorado River in Arizona and California, including the last unchannelized section before the river enters Mexico. The refuge includes low, heavily vegetated land along the Colorado River as well as higher areas with less vegetation on both sides of the river.

  The far southeastern corner of the SEZ is visible from some areas within the northern portion of the refuge. Approximately 1,749 acres (7 km^2), or 6% of Imperial NWR's total acreage, is contained within the 650-ft (198.1-m) viewshed of the SEZ, and 1,381 acres (6 km^2), or 4% of the refuge's total acreage, is within the 24.6-ft (7.5-m) viewshed. The portions of the refuge within the viewshed extend from the point of nearest approach at the northern boundary of the refuge to beyond 25 mi (41 km) from the SEZ.

  Within 25 mi (41 km) of the SEZ, where vegetative screening is absent, solar facilities located in the far southeastern portions of the SEZ might be visible from the highest points within the refuge. Because of the very long distance to the SEZ and screening by the Palo Verde Mountains, visible portions of the SEZ would occupy a very small portion of the field of view. The refuge is at a slightly lower elevation than the SEZ. Any visible solar facilities within the SEZ would be viewed at very low angles. Solar collector/reflector arrays would be viewed edge-on and, at distance exceeding 22 mi (35 km), are unlikely to be distinguishable. If power towers were visible, they would likely appear as distant point light sources on the northern horizon. At night, if sufficiently tall, the power towers could have red or white flashing hazard navigation lights that could potentially be visible from the refuge. Visual impacts on the Imperial NWR from solar development within the SEZ would be expected to be minimal.

National Natural Landmarks

- *Turtle Mountains NNL*—The Turtle Mountains NNL comprises 50,057 acres (202.57 km^2) designated for outstanding scenic values, located almost entirely within the Turtle Mountains WA (see above). The Turtle Mountains NNL encompasses the same lands as the Turtle Mountain Scenic ACEC.

Visual impacts on the Turtle Mountains NNL associated with utility-scale solar energy development in the proposed Riverside East SEZ would be similar to those described for the Turtle Mountains WA (see above).

ACECs Designated for Outstanding Scenic Qualities

- *Corn Springs ACEC*—The Corn Springs ACEC is a 2,463-acre (10-km^2) BLM-designated ACEC located 4.8 mi (7.7 km) south of the SEZ at the point of closest approach. The ACEC contains land in and around a canyon in the Chuckwalla Mountains Wilderness. The ACEC was designated for its prehistoric/historic values, outstanding scenery, wildlife habitat, and vegetation, and the ACEC also contains petroglyphs. Corn Springs is also a Cahuilla Indian sacred site. The Corn Springs Campground is located in the canyon, situated by a stand of native California fan palms.

  Much of the SEZ is visible from the eastern portion of the SEZ outside Corn Springs Canyon, and a very small portion of the SEZ is visible from within the canyon. The area of the ACEC within the viewshed of the SEZ encompasses 1,080 acres (4 km^2) in the 650-ft (198.1-m) viewshed, or 44% of the total ACEC acreage. Portions of the ACEC within the 24.6-ft (7.5-m) viewshed include approximately 941 acres (4 km^2), or 38% of the total ACEC acreage. The portions of the ACEC within the viewshed extend from the point of nearest approach to approximately 5.9 mi (9.5 km) from the SEZ.

  The SEZ is largely screened from view within the canyon itself, although there is a very limited view of the SEZ almost straight east from Corn Springs Road as it crosses a slightly elevated bench in the western part of the canyon. The view of the SEZ from this location is limited by screening from the canyon walls to a very small area in the far southeastern portion of the SEZ, more than 29 mi (47 km) distant, and at such a low angle of view that visual impacts from any solar facilities visible from that location would be expected to be minimal.

  Within the ACEC, near the eastern mouth of the canyon where the canyon outwash turns northward toward the Chuckwalla Valley, views of the SEZ open up to the north and east. As Corn Springs Road crosses east of the wash, views open up even more as the Chuckwalla Mountains no longer screen views of the western portion of the SEZ.

  Figure 9.4.14.2-21 is a Google Earth visualization of the SEZ as seen from Corn Springs Road approximately 0.2 mi (0.4 km) north of the southern boundary of the ACEC and 0.4 mi (0.7 km) from the eastern boundary of the ACEC. The viewpoint is approximately 5 mi (8 km) south of the SEZ and is elevated about 600 ft (180 m) over the closest portion of the SEZ and about 850 ft (260 m) over the valley floor. The visualization suggests that from this

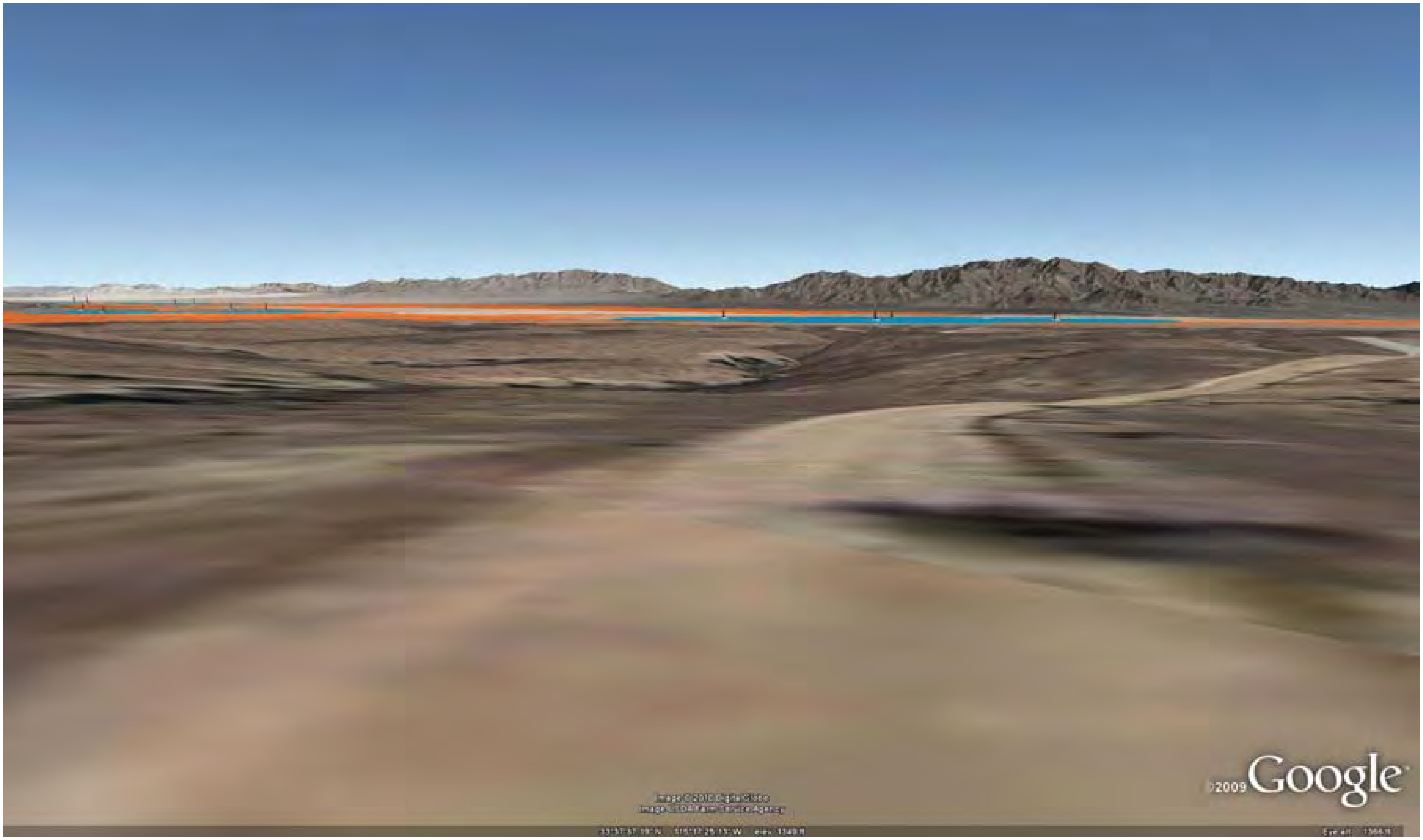

FIGURE 9.4.14.2-21 Google Earth Visualization of the Proposed Riverside East SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from a Viewpoint on Corn Springs Road within the Corn Springs ACEC

elevated viewpoint, the SEZ would be too large to be encompassed in one view, and viewers would need to turn their heads to scan across the whole SEZ. The entire Chuckwalla Valley visible from this location would present a variety of solar facilities with associated transmission facilities and roads, stretching across the valley floor to the base of the bajada of the Palen Mountains and to the other mountain ranges north of the SEZ. The angle of view is low enough, however, that the valley itself appears as a band across the base of the mountains, so most of the development in the valley would be viewed from a low oblique angle that would reduce the visible surface area and associated visual impacts.

The tops of solar collector/reflector arrays in the closest parts of the SEZ would likely be visible, but the angle of view is low enough that most facilities would appear close to edge-on, appearing as a thin band that would tend to repeat the line of the horizon.

Taller ancillary facilities, such as buildings, transmission structures, and cooling towers, and plumes (if present) would likely be visible projecting above the collector/reflector arrays, at least for nearby facilities, and their structural details could be evident. The ancillary facilities could create form and line contrasts with the strongly horizontal, regular, and repeating forms and lines of the collector/reflector arrays. Color and texture contrasts would also be likely, but their extent would depend on the materials and surface treatments utilized in the facilities.

If power towers were present within the SEZ, closer receivers would likely appear as bright points of light atop discernable tower structures against the backdrop of the valley floor or the bajada of the Palen Mountains. The tower structures and power block facilities would likely be visible for projects close to the viewpoint, but receiver lights would be dimmer and ancillary facilities more difficult to discern for projects farther from the viewpoint, as the distance increased and the viewing angle decreased.

At night, if sufficiently tall, the power towers could have red or white flashing hazard navigation lights that likely would be visible from this location in the ACEC and could be very conspicuous, given the dark night skies in the vicinity of the SEZ, although there would be lighting from I-10 and other sources visible as well. Other lighting associated with solar facilities in the SEZ could potentially be visible as well, at least for facilities in the closest portions of the SEZ.

The potential visual contrast expected for this viewpoint would vary depending on the numbers, types, sizes, and locations of solar facilities in the SEZ and on other project- and site-specific factors, but under the 80% development scenario analyzed in this PEIS, solar facilities within the SEZ would be expected to create strong visual contrasts as viewed from this location within the ACEC.

In summary, visual contrasts associated with solar energy development within the SEZ would depend on viewer location within the ACEC; on solar facility type, size, and location within the SEZ; and on other visibility factors. Inside Corn Spring Canyon, visibility of solar facilities in the SEZ would be very limited; views would be at very long distances; and expected contrast levels would be minimal. Outside of the canyon at points on or along Corn Springs Road, with a clear view of the SEZ, under the 80% development scenario analyzed in this PEIS, strong levels of visual contrast would be expected.

- *Turtle Mountain ACEC*—The Turtle Mountains ACEC is a 50,057-acre (203-km^2) BLM-designated ACEC located approximately 20.8 mi (33.5 km) north of the SEZ at the point of closest approach. The ACEC encompasses the Turtle Mountains NNL. The ACEC was designated for its scenic values.

  The area of the ACEC within the 650-ft (198.1-m) viewshed of the SEZ includes 2,355 acres (10 km^2), or 5% of the total ACEC acreage. The area within the 24.6-ft (7.5-m) viewshed of the SEZ includes 856 acres (4 km^2), or 2% of the total ACEC acreage. The visible portions of the ACEC extend from the point of closest approach to beyond 25 mi (41 km) from the SEZ.

- Visual impacts on the Turtle Mountains ACEC associated with utility-scale solar energy development in the proposed Riverside East SEZ would be similar to those described for the Turtle Mountains WA (see above).

Scenic Highways/Byways

- *Bradshaw Trail*—The Bradshaw Trail is a BLM Backcountry Byway that runs parallel to the southern boundary of the SEZ. The trail traverses mostly public land between the Chuckwalla Mountains and the Chocolate Mountain Aerial Gunnery Range, with spectacular views of the Chuckwalla Bench, Orocopia Mountains, Chuckwalla Mountains and the Palo Verde Valley. It is currently unpaved, and is accessible with four-wheel drive vehicles.

  Approximately 23 mi (37.0 km) of the trail is within the calculated 650-ft (198.1-m) viewshed of the SEZ. Near the southeastern corner of the SEZ, the Bradshaw Trail passes within 1.7 mi (2.8 km) of the SEZ and parallels the SEZ at roughly that distance for a little more than 6 mi (10 km); however, views of the SEZ from the trail would be screened by the Mule Mountains for most of that distance. As the trail heads west, it veers slightly south to pass to the south of the Little Chuckwalla Mountains and after about 15 additional mi (24 km) passes out of the SEZ 650-ft (198.1-m) viewshed.

The trail climbs steadily as it runs west, from an elevation of about 240 ft (73.2 m) above mean seal level near the southeast corner of the SEZ to about 1,240 ft (378 m) above mean sea level at the point it passes out of the SEZ viewshed. For that portion of the trail closest to the SEZ, the trail is at a slightly lower elevation, which would ensure a very low angle of view to the SEZ.

Figure 9.4.14.2-22 is a Google Earth perspective visualization of the SEZ as seen from the Bradshaw Trail 1.7 mi (2.8 km) south of the southeast corner of the SEZ. The viewpoint is roughly 20 ft (6 m) lower in elevation than the SEZ in the vicinity. The view direction is north.

In the visualization, the SEZ and very distant heliostat arrays depicted in the power tower model cluster appear edge-on, as a very narrow band parallel to, and repeating, the strong horizon line. The very low angle of view would greatly reduce the visible area of solar collector/reflector arrays, conceal their strong regular geometry, and thus reduces associated visual contrast. The model cluster at center right is approximately 18 mi (29 km) from the viewpoint; however, if solar facilities were closer to the viewpoint, they would cause greater levels of visual contrast, and if they were close to the southeastern corner of the SEZ, they could potentially give rise to moderate to strong visual contrasts.

If power towers were present within the SEZ, at the distance shown here, the receivers could appear as distant point light sources against the backdrop of the Big Maria Mountains. Transmission towers could be visible above the solar collector/reflector arrays. Receivers on closer power towers could be much brighter.

At night, if sufficiently tall, the power towers could have red or white flashing hazard navigation lights that would likely be visible from the Trail and could be very conspicuous from this viewpoint, given the dark night skies in the vicinity of the SEZ and the short distance to the SEZ. Other lighting associated with solar facilities in the SEZ could potentially be visible as well, at least for facilities in the closest portions of the SEZ.

The potential visual contrast expected for this viewpoint would depend on the numbers, types, sizes, and locations of solar facilities in the SEZ and on other project- and site-specific factors. Under the 80% development scenario, solar facilities within the SEZ would be expected to create weak to moderate visual contrasts as viewed from this location on the trail.

On average, eastbound travelers on the Bradshaw Trail would be more likely to experience visual impacts from solar energy development in the SEZ than

FIGURE 9.4.14.2-22 Google Earth Visualization of the Proposed Riverside East SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from the Bradshaw Trail near the Southeast Corner of the SEZ

westbound travelers. As eastbound travelers approached the SEZ, they would be at a higher elevation than the SEZ and so would see more of the SEZ and solar facilities within it, but they would also have more extended views of the SEZ as they descended the trail. Westbound travelers would be facing away from the SEZ as they climbed the trail behind the Little Chuckwalla Mountains.

Figure 9.4.14.2-23 is a Google Earth perspective visualization of the SEZ as it would be seen by eastbound travelers on the Bradshaw Trail 5.7 mi (9.2 km) southwest of the SEZ at the western edge of the Mule Mountains. The viewpoint is roughly 240 ft (73 m) higher in elevation than the SEZ is in the direction of travel. The view direction is northeast.

In the visualization, the SEZ and very distant heliostat arrays depicted in the power tower model cluster appear edge-on, as a very narrow band parallel to, and repeating, the strong horizon line and thus greatly reducing their visible area and associated visual contrast. The model cluster at center right is approximately 9 mi (14 km) from the viewpoint.

If power towers were present within the SEZ, at the distance shown here, the receivers could appear as bright point light sources atop discernable tower structures against the backdrop of the Big Maria Mountains or the sky. Transmission towers could be visible above the solar collector/reflector arrays.

At night, if sufficiently tall, the power towers could have red or white flashing hazard navigation lights that could be visible from this location. Other lighting associated with solar facilities in the SEZ could potentially be visible as well, at least for facilities in the closest portions of the SEZ.

The potential visual contrast expected for this viewpoint would depend on the numbers, types, sizes and locations of solar facilities in the SEZ, and other project- and site-specific factors. Under the 80% development scenario, solar facilities within the SEZ would be expected to create moderate visual contrasts as viewed from this location on the trail.

In summary, visual contrasts associated with solar energy development within the SEZ would depend on viewer location on the Bradshaw Trail; on solar facility type, size, and location within the SEZ; and on other visibility factors. On much of the trail, visibility of solar facilities in the SEZ would be very limited; views would be at long distances; and expected contrast levels would be minimal. However, under the 80% development scenario analyzed in this PEIS, moderate or strong levels of visual contrast would be expected for some locations with elevated viewpoints or low-elevation viewpoints very close to the SEZ. In general, because of view direction and duration, eastbound

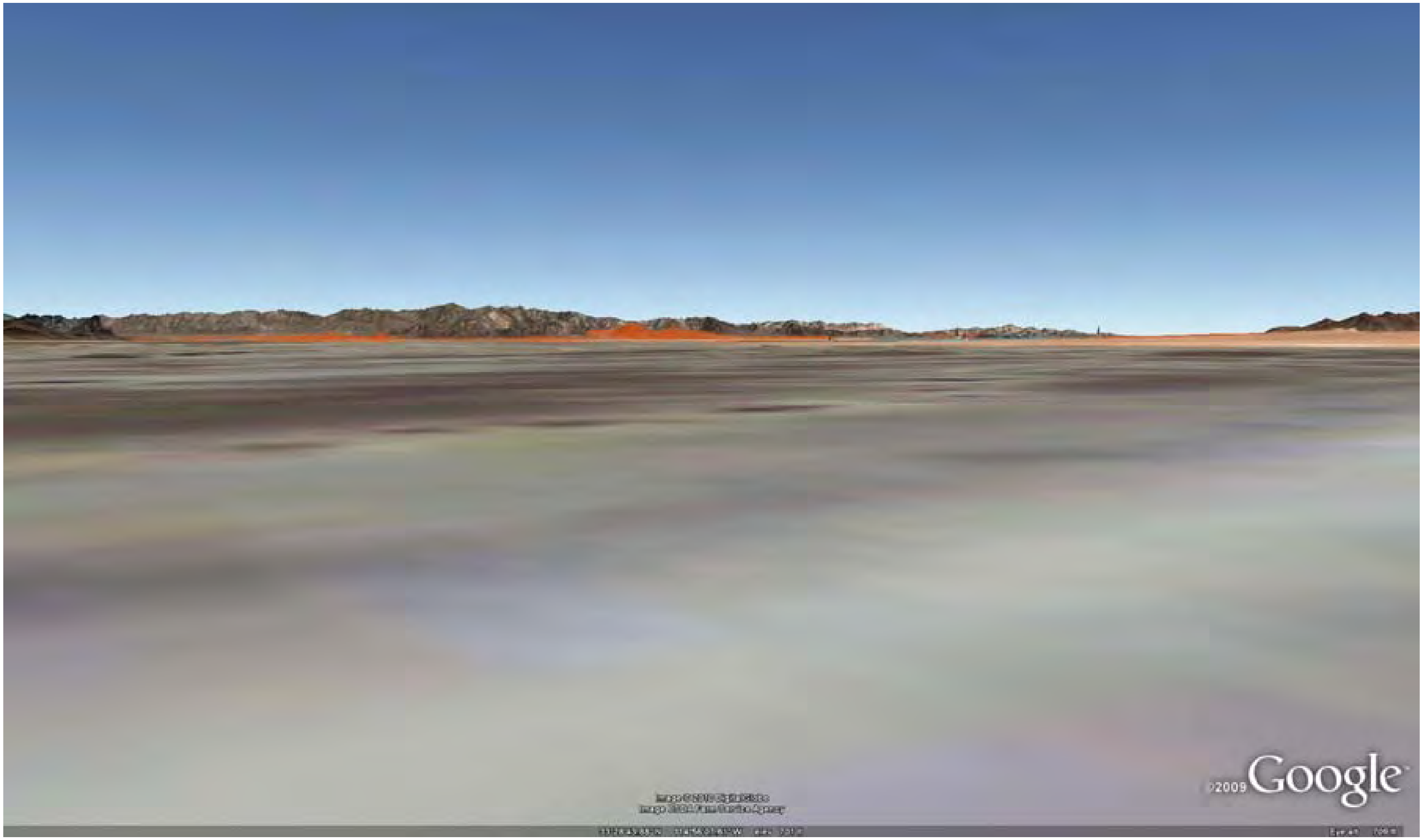

FIGURE 9.4.14.2-23 Google Earth Visualization of the Proposed Riverside East SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from the Bradshaw Trail near the Mule Mountains

travelers on the trail would be subject to higher contrast levels than westbound travelers.

Additional scenic resources exist at the national, state, and local levels, and impacts may occur on both federal and nonfederal lands, including sensitive traditional cultural properties important to Tribes. Note that in addition to the resource types and specific resources analyzed in this PEIS, future site-specific NEPA analyses would include state and local parks, recreation areas, other sensitive visual resources, and communities close enough to the proposed project to be affected by visual impacts. Selected other lands and resources are included in the discussion below.

In addition to impacts associated with the solar energy facilities themselves, sensitive visual resources could be affected by facilities that would be built and operated in conjunction with the solar facilities. With respect to visual impacts, the most important associated facilities would be access roads and transmission lines, the precise location of which cannot be determined until a specific solar energy project is proposed. Currently, a 500-kV, a 230-kV, and a 69-kV transmission line are within the proposed SEZ. For this analysis, the impacts of construction and operation of transmission lines outside of the SEZ were not assessed, assuming that the existing transmission lines might be used to connect some new solar facilities to load centers and that additional project-specific analysis would be performed for new transmission construction or line upgrades. Note that depending on project- and site-specific conditions, visual impacts associated with access roads, and particularly transmission lines, could be large. Detailed information about visual impacts associated with transmission lines is presented in Section 5.12.1. 5. A detailed site-specific NEPA analysis would be required to determine visibility and associated impacts precisely for any future solar projects, based on more precise knowledge of facility location and characteristics.

Impacts on Selected Other Lands and Resources

Interstate 10. I-10 passes through the SEZ for a distance of approximately 4.0 mi (6.4 km), abuts the southern boundary of the SEZ for an additional 1.7 mi (2.7 km), and is within 0.67 mi (1.1 km) of the SEZ for an additional 34 mi (55 km). As shown in Figure 9.4.14.2-2, approximately 79 mi (127 km) of I-10 is within the 650-ft (198.1-m) viewshed of the Riverside East SEZ. I-40 intersects the SEZ in five separate areas, ranging in length from approximately 0.04 to 3 mi (0.06 to 4.8 km). Undulations in topography as well as buildings screen views of portions of the SEZ from some locations along I-10; however, there are generally open views of the SEZ from I-10 throughout the viewshed.

For westbound travelers on I-10, solar facilities within the SEZ would likely come into view just past a pass in the Dome Rock Mountains, about 8.5 mi (13.6 km) east of Ehrenberg, about 34 mi (55 km) from the eastern boundary of the SEZ. At that distance, the SEZ would occupy a substantial portion of the horizontal field of view directly from the Interstate; however, because of the distance, visual contrasts would likely be weak. As travelers descend the foothills of the Dome Rock Mountains, the road passes through several dips that might partially conceal some facilities within the SEZ briefly, but some part of the SEZ would be in nearly continuous view, with visual contrasts due to solar facilities within the SEZ gradually increasing as the distance to the SEZ decreased and the apparent height and width of the solar facilities increased. In about 15 to 20 minutes after first coming into view, the SEZ would occupy much of the northwestern horizon north of I-10. The viewing angle would be low and would decrease as travelers approach the Colorado River Valley, so that the SEZ and associated solar development would appear as a thin band just under the Chuckwalla and McCoy Mountains.

As travelers pass through the Palo Verde Valley, their elevation would drop below that of the SEZ, and eventually, the western slope of the valley that climbs to the Palo Verde Mesa would gradually cut off views of the SEZ and associated solar facilities. By the time travelers reach State Route 78, except for a view of the far northeast corner of the SEZ straight north, the SEZ would be cut off entirely from view. Less than 1 mi (1.6 km) west of State Route78, the elevation climbs again rapidly, and the SEZ would again become visible, but much closer, with stronger contrast levels. At Blythe Airport, another ridge would cut off views of the SEZ, and after travelers cross this ridge to the Palo Verde Mesa, the SEZ would again come back into view, at this point filling the view to the west and north and likely dominating the view at 1 mi (1.6 km) from the eastern boundary of the SEZ. At night, if there were hazard navigation lights on sufficiently tall power towers, depending on their location within the SEZ, they could be visible to travelers on I-10 approaching the SEZ, gradually increasing in brightness and height above the horizon, and potentially becoming very conspicuous in the night sky as travelers approached the SEZ closely.

Figure 9.4.14.2-24 is a Google Earth perspective visualization of the SEZ as seen from I-10, approximately 7.4 mi (11.9 km) east of the intersection of I-10 and the SEZ, just west of Blythe and facing west toward the SEZ. The visualization suggests that from this location, the SEZ would occupy much of the horizontal field of view, but because the viewing angle is very low, small undulations in topography might screen views of lower height solar facilities away from the roadways, and visible facilities would be seen edge-on, which would tend to reduce visual contrasts. If power tower facilities were present within the SEZ, the receivers of power towers in the far eastern portion of the SEZ could appear as very bright points of light atop visible tower structures on the western horizon, against a sky or mountain backdrop. These bright light sources could potentially interfere with views of the distant mountains.

Figure 9.4.14.2-25 is a Google Earth perspective visualization of the SEZ as seen from I-10, approximately 0.7 mi (1 km) east of the intersection of the highway and the SEZ, facing southwest toward two power tower models just south of I-10. The closest tower is approximately 1.6 mi (2.5 km) from the viewpoint. The visualization suggests that from this location, solar facilities within the SEZ would be in full view. The SEZ would occupy more than the entire field of view, so travelers would have to turn their heads to scan across the full SEZ. Facilities located within the far eastern portion of the SEZ could strongly attract the eye and likely dominate views from I-10.

Taller ancillary facilities, such as buildings, transmission structures, and cooling towers, and plumes (if present) would likely be visible projecting above the collector/reflector arrays, and their structural details could be evident, at least for nearby facilities. The ancillary facilities

FIGURE 9.4.14.2-24 Google Earth Visualization of the Proposed Riverside East SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from I-10 Approximately 7.4 mi (11.9 km) East of the SEZ

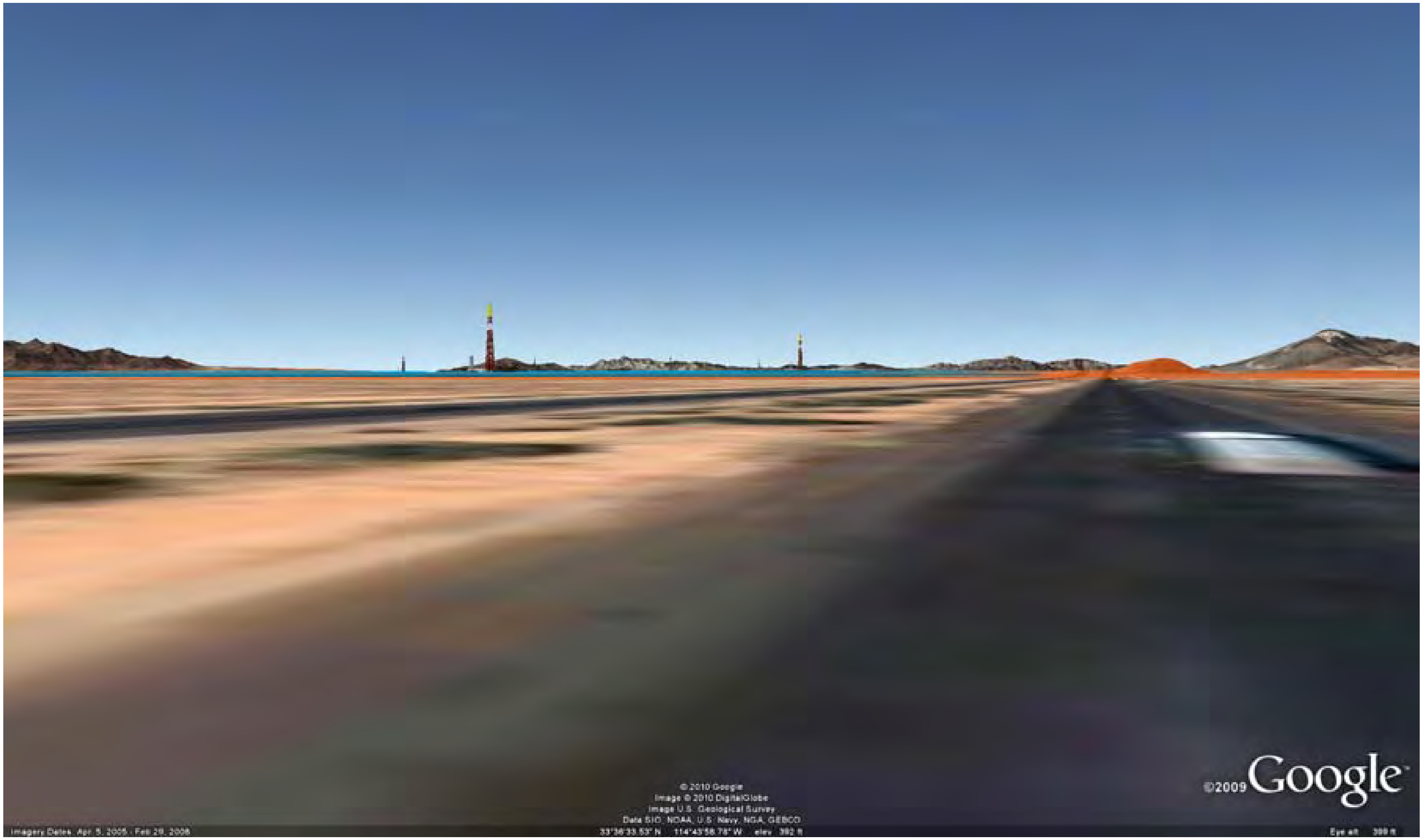

FIGURE 9.4.14.2-25 Google Earth Visualization of the Proposed Riverside East SEZ (shown in orange tint) and Surrounding Lands, with Power Tower Wireframe Models, as Seen from I-10 Approximately 0.7 mi (1 km) East of the SEZ

could create form and line contrasts with the strongly horizontal, regular, and repeating forms and lines of the collector/reflector arrays. Color and texture contrasts also would be likely, but their extent would depend on the materials and surface treatments utilized in the facilities. Steam plumes, transmission towers, and other tall facility components likely would project above the mountains. From this viewpoint, solar collector/reflector arrays would be seen nearly edge-on and would repeat the horizontal line of the plain in which the SEZ is situated; this would reduce their apparent size and conceal the strong regular geometry of the arrays, tending to reduce visual contrast, but as the viewer approached the SEZ, the collector/reflector arrays could increase in apparent size until their individual forms became plainly visible, and they no longer appeared as horizontal lines against the natural-appearing backdrop.

Views of the Chuckwalla Valley and the mountain ranges on either side of the valley could be partially screened by solar facilities, depending on the layout of solar facilities within the SEZ. Because of the potentially very short distance of solar facilities from I-10, strong visual contrasts likely would result, depending on solar project characteristics and location within the SEZ.

Visual contrast would increase further after travelers on I-10 entered the SEZ. If power tower facilities were located in the SEZ, the receivers could appear as brilliant light sources on either side of the highway and would likely strongly attract views. For nearby power towers, during certain times of the day from certain angles, sunlight on dust particles in the air might result in the appearance of light streaming down from the tower(s). At night, if sufficiently tall, the power towers could have red or white flashing hazard navigation lights that would likely be very conspicuous from I-10. Other lighting associated with solar facilities in the SEZ could potentially be visible as well, at least for facilities in the closest portions of the SEZ. Ahead, down the roadway, if solar facilities were located on both the north and south sides of I-10, the banks of solar collectors/reflectors on both sides could form a visual "tunnel," which travelers would pass through briefly. If solar facilities were located close to the roadway, given the 80% development scenario analyzed in this PEIS, they would be expected to dominate views from I-10 and would create strong visual contrasts. After travelers pass through the section of SEZ, the SEZ would still be very close to I-10 on one or the other side of the highway. Impact levels would be dependent on the presence of solar facilities in areas near the roadway and on solar facility characteristics.

Travelers heading east on I-10 would in general be subjected to the same types of visual contrasts, but the order would be reversed, and this could change the perceived impact levels. Because of differences in topography between the eastern and western approaches to the SEZ, more of the SEZ would be visible for longer distances for eastbound travelers. Solar facilities within the SEZ could be visible as far as Chiriaco Summit (18 mi [29 km] west of the SEZ), with power tower receivers appearing as distant lights on the eastern horizon at that distance.

From Chiriaco Summit eastward, except for brief periods, travelers would have continuous visibility of solar facilities within some part of the SEZ as they approach it. Solar facilities within the SEZ would gradually increase in apparent size, with the view opening up substantially (and visual contrast levels rising accordingly) as travelers approach Desert Center.

Visual dominance of the solar facilities within the SEZ would increase steadily until peaking when travelers entered and passed through the SEZ.

In summary, visual contrasts associated with solar energy development within the SEZ would depend on viewer location on I-10; on solar facility type, size, and location within the SEZ; and on other visibility factors. The SEZ would be visible at long distances on I-10 for both eastbound and westbound travelers, although westbound travelers would have intermittent visibility of the SEZ because of periodic screening. However, under the 80% development scenario analyzed in this PEIS, strong levels of visual contrast would be expected as travelers in both directions approached and passed through the SEZ.

State Route 177. State Route 177 passes through or is immediately adjacent to the SEZ for a distance of approximately 8.4 mi (13.5 km). As shown in Figure 9.4.14.2-2, approximately 27 mi (43 km) of State Route 177 is within the 650-ft (198.1-m) viewshed of the Riverside East SEZ. State Route 177 intersects the SEZ in two separate areas in lengths of approximately 3 mi (4.8 km) and 5.4 mi (8.7 km). Undulations in topography as well as buildings may screen views of portions of the SEZ from some locations along the route; however, there are generally open views of the SEZ from State Route 177 throughout the viewshed.

Moving northward on State Route 177 from Desert Center, travelers would immediately enter the SEZ, after having experienced in some degree the impacts described above for I-10. Under the 80% development scenario analyzed in this PEIS, visual contrasts from solar energy development within the SEZ could potentially cause strong visual contrasts for travelers on State Route 177 and would likely dominate the view from some locations on State Route 177.

Between Desert Center and the northern boundary of the SEZ, where State Route 177 is not actually within the SEZ itself, it is not more than 1 mi (1.6 km) from the SEZ. In these areas, visual contrasts might be somewhat lower than those experienced within the SEZ itself, but because the distance to the SEZ is so short, visual contrasts could still be strong and solar development within the SEZ could dominate views from State Route 177.

Both within and near the SEZ, for travelers on State Route 177, solar collector/reflector arrays for solar facilities within the SEZ would be seen nearly edge-on. This would reduce their apparent size, conceal their strong regular geometry, and cause them to repeat the horizontal line of the plain in which the SEZ is situated; this would tend to reduce visual contrast. However, as the viewer passes through the SEZ, the collector/reflector arrays could increase in apparent size until they no longer appear as horizontal lines against the natural-appearing backdrop.

Taller ancillary facilities, such as buildings, transmission structures, and cooling towers, and plumes (if present) likely would be visible projecting above the collector/reflector arrays, and their structural details could be evident, at least for nearby facilities. The ancillary facilities could create form and line contrasts with the strongly horizontal, regular, and repeating forms and lines of the collector/reflector arrays. Color and texture contrasts would also be likely, but their extent would depend on the materials and surface treatments utilized in the facilities.

If power tower facilities were located in the SEZ, the receivers could appear as brilliant light sources on either side of the highway. They could project above nearby mountains, be visible against a sky backdrop, and likely strongly attract views. For nearby power towers, during certain times of the day from certain angles, sunlight on dust particles in the air might result in the appearance of light streaming down from the tower(s). Steam plumes, transmission towers, and other tall facility components could also project above the mountains.

At night, if sufficiently tall, the power towers could have red or white flashing hazard navigation lights that likely would be very conspicuous from I-10. Other lighting associated with solar facilities in the SEZ could potentially be visible as well, at least for facilities in the closest portions of the SEZ.

State Route 177 travelers heading south from the Palen Valley would in general be subjected to the same types of visual contrasts, but the order would be reversed, and this could change the perceived impact levels. The SEZ would come into view about 9 mi (14 km) north of the SEZ, shortly after crossing Granite Pass, and the SEZ (and solar development within the SEZ) would be visible for approximate 7 to 9 minutes, gradually increasing in size, until travelers enter the SEZ itself.

Communities of Blythe, East Blythe, Palo Verde, Ripley, Cibola (Arizona) and Desert Center. The viewshed analyses indicate visibility of the SEZ from the communities of Blythe (approximately 8.3 mi [13.4 km] east of the SEZ); East Blythe (approximately 9.6 mi [15.5 km] east of the SEZ); Ehrenberg (approximately 13 mi [21 km] east of the SEZ); Palo Verde (approximately 5.8 mi [9.3 km] south of the SEZ); Ripley (approximately 4.5 mi [7.2 km] east of the SEZ); Cibola, located in Arizona (approximately 15 mi [24 km] southwest of the SEZ); and Desert Center (adjacent to the southwest boundary of the SEZ).

Blythe, East Blythe, Ehrenberg, Palo Verde, Ripley, and Cibola are all communities in or very close to the Palo Verde Valley east of the SEZ. The elevations in Blythe, East Blythe, Ehrenberg, Palo Verde, Ripley, and Cibola range from 233 to 276 ft (71 to 84 m), and all these communities are more than 100 ft (30 m) lower in elevation than the eastern border the SEZ. Thus, there is a low angle of view between these communities and the SEZ; this would tend to reduce the visibility of solar facilities within the SEZ and would therefore reduce associated impacts. Desert Center is located at the far southwestern corner of the SEZ off I-10. Desert Center (approximate elevation 905 ft [276 m] above mean sea level) is at a slightly higher elevation than most portions of the SEZ immediately adjacent to it, and is several hundred feet higher than the lowest points nearby in the SEZ.

Screening by small undulations in topography, vegetation, buildings, or other structures would likely restrict or eliminate visibility of the SEZ and associated solar facilities within these communities, but a detailed future site-specific NEPA analysis is required to determine visibility precisely. However, note that even with existing screening, solar power towers, cooling towers, plumes, transmission lines and towers, or other tall structures associated with the development could potentially be tall enough to exceed the height of screening in some areas and could therefore cause visual impacts on these communities.

The western-most portions of Blythe are slightly less than 5 mi (8 km) from the closest point on the eastern boundary of the SEZ. In general, absent screening by nearby structures or vegetation, Blythe and East Blythe have unobstructed views of the SEZ, which would occupy much of the western horizon visible from these communities. However, the angle of view is low, so that if solar facilities were visible within the SEZ, they would be viewed edge-on and would repeat the line of the horizon, tending to reduce visual contrast. The light from power tower receivers within the eastern-most portions of the SEZ would likely appear as very bright nonpoint (i.e., having a visible cylindrical or rectangular surface) sources of light atop discernable tower structures on the western horizon.

At night, if sufficiently tall, the power towers could have red or white flashing hazard navigation lights that likely would be visible from these communities and could be conspicuous from some location, given the dark night skies in the vicinity of the SEZ. Other lighting associated with solar facilities in the SEZ could potentially be visible from some locations as well, at least for facilities in the closest portions of the SEZ.

Visual contrasts associated with solar facilities within the SEZ would vary greatly, depending on the presence of screening by nearby structures and vegetation and on project locations, technologies, and site designs within the SEZ, but where there were unobstructed views, these contrasts would be expected to be moderate to strong. In general, contrasts would be expected to be greatest for locations on the western side of Blythe, with lesser contrast levels in eastern Blythe and the community of East Blythe.

The community of Ehrenberg is located approximately 4 mi (6 km) east of Blythe, at the same elevation as Blythe. Ehrenberg would have essentially the same view of solar development within the SEZ as Blythe, but lower visual contrast levels would be expected in Ehrenberg because of the increased distance to the SEZ. Where there were unobstructed views, contrast levels would be expected to be weak to moderate.

The community of Ripley is located approximately 7 mi (11 km) southwest of Blythe, and between 4 to 5 mi (6 to 8 km) from the far southeastern boundary of the SEZ. In general, absent screening by nearby structures or vegetation, Ripley has unobstructed views of the SEZ, which would occupy much of the northwestern horizon visible from Ripley. However, the angle of view is low, so that if solar facilities were visible within the SEZ, they would be viewed edge-on and would repeat the line of the horizon, tending to reduce visual contrast. The light from power tower receivers within the far southeastern portion of the SEZ would likely appear as very bright nonpoint sources of light to the northwest and could appear silhouetted against the sky looking west down the Chuckwalla Valley. At night, if sufficiently tall, the power towers could have red or white flashing hazard navigation lights that likely would be visible from Ripley and could be conspicuous. Other lighting associated with solar facilities in the SEZ could potentially be visible from some locations as well, at least for facilities in the closest portions of the SEZ.

Visual contrasts associated with solar facilities within the SEZ would vary greatly depending on the presence of screening by nearby structures and vegetation and on project locations, technologies, and site designs within the SEZ, but where there were unobstructed views, contrasts would be expected to be moderate to strong.

The community of Palo Verde is approximately 6 mi (10 km) south of the far southeastern corner of the SEZ. The Mule and Little Chuckwalla Mountains screen views of most of the western parts of the SEZ from Palo Verde; however, much of the southeastern portion of the SEZ would be visible on the northern horizon. The angle of view is low, so that if solar facilities were visible within the SEZ, they would be viewed edge-on and would repeat the line of the horizon, tending to reduce visual contrast. The light from power tower receivers within the far southeastern portions of the SEZ could appear as bright point or nonpoint sources of light on the northern horizon. Power towers with hazard lighting could be visible at night and could be conspicuous depending on project location and other visibility factors. Visual contrasts associated with solar facilities within the SEZ would vary greatly depending on the numbers, types, sizes, and locations of solar facilities in the SEZ and on other project- and site-specific factors, but where there were unobstructed views, contrasts would be expected to be weak to moderate.

The community of Cibola in Arizona is approximately 21 mi (34 km) south of Blythe and approximately 15 mi (24 km) from the far southeastern corner of the SEZ. The Mule and Little Chuckwalla Mountains screen views of most of the western parts of the SEZ from Cibola; however, portions of the southeastern portion of the SEZ would be visible on the northern horizon. The angle of view is low, so that if solar facilities were visible within the SEZ, they would be viewed edge-on and would repeat the line of the horizon, tending to reduce visual contrast. The light from power tower receivers within the far southeastern portion of the SEZ would likely appear as very distant point sources of light on the northern horizon. Visual contrasts associated with solar facilities within the SEZ would depend on the numbers, types, sizes, and locations of solar facilities in the SEZ and on other project- and site-specific factors, but where there were unobstructed views, contrasts would be expected to be weak.

The community of Desert Center and the Lake Tamarisk housing development are located immediately adjacent to the far southwest corner of the SEZ. Desert Center is located at the Rice Rd (State Route 177) interchange on I-10, and Lake Tamarisk is less than 2 mi (3 km) north of Desert Center. In general, absent screening by nearby structures or vegetation, Desert Center and Lake Tamarisk have unobstructed views of the SEZ, which in the case of Desert Center would surround the community in all directions except south (across I-10) and in the case of Lake Tamarisk would surround the community in all directions except west.

From Desert Center and Lake Tamarisk, the SEZ could not be encompassed in one view, and viewers would need to turn their heads to scan across the whole SEZ. Solar facility collector/reflector arrays would be viewed nearly edge-on, reducing the visible area for each facility and presenting a banded appearance that would repeat the line of the horizon, tending to reduce visual contrast. If nearby facilities used PV systems and low-profile ancillary facilities, the visual impacts would be lessened, but for facilities utilizing STGs, taller structures projecting above the collector/reflector arrays would be visible, and in some conditions steam plumes could be present that would add significantly to visual contrasts. These taller elements would add vertical line and form contrasts, and likely color contrasts as well; steam plumes would add color and possibly line or form contrasts, depending on conditions. Depending on height, these ancillary facilities could add significantly to visual contrasts for some facilities. For all projects, transmission towers, lines, and substations might be visible, which could add substantially to form and line contrasts. Structural details of collectors and ancillary facilities (buildings, STGs, substations, and so on) could be visible within nearby facilities. The tops of solar collector/reflector arrays in the closest parts of the SEZ would not likely be visible, but because the ground slopes downward to the east and north of Desert Center and Lake Tamarisk, the tops of collector/reflector arrays could be visible for facilities farther way, and this would increase chances of reflections from collector/reflector arrays, thermal tubes, and other facilities, depending on facility design, location, distance, and other visibility factors. If power towers were present within the SEZ, nearby receivers would likely appear as brilliant nonpoint (i.e., having visible cylindrical or rectangular surfaces) light sources atop clearly discernable tower structures against the backdrop of the sky above the surrounding mountains or against the mountain slopes, which could potentially cause discomfort when looked at directly. More distant receivers would likely appear as points of light against the sky, against the backdrop of the valley floor, or against the bajadas and slopes of the nearby mountains.

At night, if sufficiently tall, the power towers could have red or white flashing hazard navigation lights that would likely be visible from Desert Center and Lake Tamarisk and could be very conspicuous from these communities, given the dark night skies in the vicinity of the SEZ, although other lights would be visible in the vicinity. Other lighting associated with solar facilities in the SEZ could potentially be visible as well, at least for facilities in the closest portions of the SEZ.

The potential visual contrast expected for these communities would depend on the numbers, types, sizes, and locations of solar facilities in the SEZ and on other project- and site-specific factors, but because Desert Center and Lake Tamarisk are adjacent to the SEZ, the SEZ would be seen in close proximity in most directions, and under the 80% development scenario analyzed in this PEIS, solar facilities within the SEZ would likely dominate views from these communities. Because there could be numerous solar facilities within the SEZ, a variety of technologies employed, and a range of supporting facilities that would contribute to visual impacts, a visually complex, man-made appearing industrial landscape could result. This essentially industrial-appearing landscape would contrast greatly with the surrounding natural-appearing lands and would be expected to create strong visual contrasts as viewed from Desert Center and Lake Tamarisk.

Regardless of visibility from within these communities, residents, workers, and visitors to the area would be likely to experience visual impacts from solar energy facilities located within the SEZ (as well as any associated access roads and transmission lines) as they travel area roads, including I-10 and State Route 177.

Nearby Residents. As noted above, there are scattered ranches and other residences on private lands immediately adjacent or close to the SEZ and elsewhere within the SEZ viewshed. Depending on technology- and project-specific factors, because of the proximity and large size of likely facilities, these residents could be subjected to large visual impacts from solar energy development within the SEZ. These impacts would be determined in the course of a site-specific environmental impact analysis.

9.4.14.2.3 Summary of Visual Resource Impacts for the Proposed Riverside East SEZ

Because there could be numerous solar facilities within the SEZ, a variety of technologies employed, and a range of supporting facilities that would contribute to visual impacts, a visually complex, man-made appearing industrial landscape could result. This essentially industrial-appearing landscape would contrast greatly with the surrounding generally natural-appearing lands. Large visual impacts on the SEZ and surrounding lands within the SEZ viewshed would be associated with solar energy development due to major modification of the character of the existing landscape. There is the potential for additional impacts from construction and operation of transmission lines and access roads within the SEZ.

Residents, workers, and visitors to the area may experience visual impacts from solar energy facilities located within the SEZ (as well as any associated access roads and transmission lines) as they travel area roads. Nearby residents could be subjected to strong visual contrasts from solar energy development within the SEZ. The communities of Blythe, East Blythe, Ehrenberg, Palo Verde, Ripley, Cibola (Arizona), and Desert Center (including the Lake Tamarisk development) are located within the viewshed of the SEZ, although slight variations in topography and vegetation provide some screening. Strong visual contrasts may be observed within Desert Center and Lake Tamarisk. Moderate to strong visual contrasts may be observed within Blythe, East Blythe, and Ripley. Weak to moderate visual contrasts may be observed within Ehrenberg and Palo Verde.

Utility-scale solar energy development within the proposed Riverside East SEZ is likely to cause moderate to strong visual impacts on highly sensitive visual resource areas, including Joshua Tree NP and WA, the Big Maria Mountains WA, Chuckwalla Mountains WA, Little Chuckwalla Mountains WA, Palen-McCoy WA, Palo Verde Mountains WA, Rice Valley WA, Corn Springs Scenic ACEC, and the Bradshaw Trail BLM Backcountry Byway.

9.4.14.3 SEZ-Specific Design Features and Design Feature Effectiveness

As noted in Section 5.12, the presence and operation of large-scale solar energy facilities and equipment would introduce major visual changes into non-industrialized landscapes and could create strong visual contrasts in line, form, color, and texture that could not easily be mitigated substantially. Implementation of the programmatic design features presented in Appendix A, Section A.2.2, would be expected to reduce the magnitude of visual impacts experienced: however, the degree of effectiveness of these design features could be assessed only at the site- and project-specific level. Given the large scale, reflective surfaces, and strong regular geometry of utility-scale solar energy facilities, and the typical lack of screening vegetation and landforms within the SEZ viewsheds, siting the facilities away from sensitive visual resource areas and other sensitive viewing areas is the primary means of mitigating visual impacts. The effectiveness of other visual impact mitigation measures would generally be limited.

While the applicability and appropriateness of some mitigation measures would depend on site- and project- specific information that would be available only after a specific solar energy project had been proposed, the following SEZ-specific design features can be identified for the Riverside East SEZ at this time:

- Within the SEZ, in areas west of the northwest corner of Section 6 of Township 006S Range 017E and in areas north and west of the northwest corner of Section 30 of Township 005S Range 018E, visual impacts associated with solar energy development in the SEZ should be consistent with VRM Class II management objectives (see Table 9.4.14.3-1), as experienced from KOPs (to be determined by the BLM) within Joshua Tree NP and the Palen-McCoy WA. The VRM Class II impact level consistency mitigation would affect approximately 67,704 acres (273.99 km^2) within the western portion of the SEZ.

- Within the SEZ, in areas visible from and within 3 mi (4.8 km) of the Rice Valley or Big Maria Mountains WAs, visual impacts associated with solar energy project operation should be consistent with VRM Class II management objectives, as experienced from KOPs (to be determined by BLM) within the WAs, and in areas visible from between 3 and 5 mi (4.8 and 8.0 km), visual impacts should be consistent with VRM Class III management objectives. The VRM Class II impact level consistency mitigation would affect approximately 11,926 acres (48.263 km^2) within the northeastern portion of the SEZ. The VRM Class III impact level consistency mitigation would affect approximately 19,676 additional acres (79.626 km^2).

Areas within the SEZ affected by these design features are shown in Figure 9.4.14.3-1.

Application of the SEZ-specific design features above would substantially reduce visual impacts associated with solar energy development within the SEZ.

Application of the distance-based mitigation to restrict allowable visual impacts associated with solar energy project in areas west of the northwest corner of Section 6 of Township 006S Range 017E and in areas north and west of the northwest corner of Section 30 of Township 005S Range 018E would substantially reduce potential visual impacts on Joshua Tree NP, the Palen-McCoy WA, the Chuckwalla Mountains WA, Corn Springs Scenic ACEC, I-10, State Route 177, and the communities of Desert Center and Lake Tamarisk, by limiting impacts within the BLM-defined and foreground–middleground distance of the viewsheds of these areas, where potential visual impacts would be greatest.

Application of the distance-based mitigation to restrict allowable visual impacts associated with solar energy project operations within 5 mi (8 km) of the Rice Valley and Big Maria Mountains WAs would substantially reduce potential visual impacts on the WAs by limiting impacts within the BLM-defined foreground of the viewshed of these areas, where potential visual impacts would be greatest. Impacts would also be reduced on I-10 and the communities within the Palo Verde Valley.

TABLE 9.4.14.3-1 VRM Management Class Objectives

VRM Management Class Objectives	
Class I Objective	The objective of this class is to preserve the existing character of the landscape. This class provides for natural ecological changes; however, it does not preclude very limited management activity. The level of change to the characteristic landscape should be very low and must not attract attention.
Class II Objective	The objective to this class is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.
Class III Objective	The objective of this class is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.
Class IV Objective	The objective of this class is to provide for management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements.

Source: BLM 1986b.

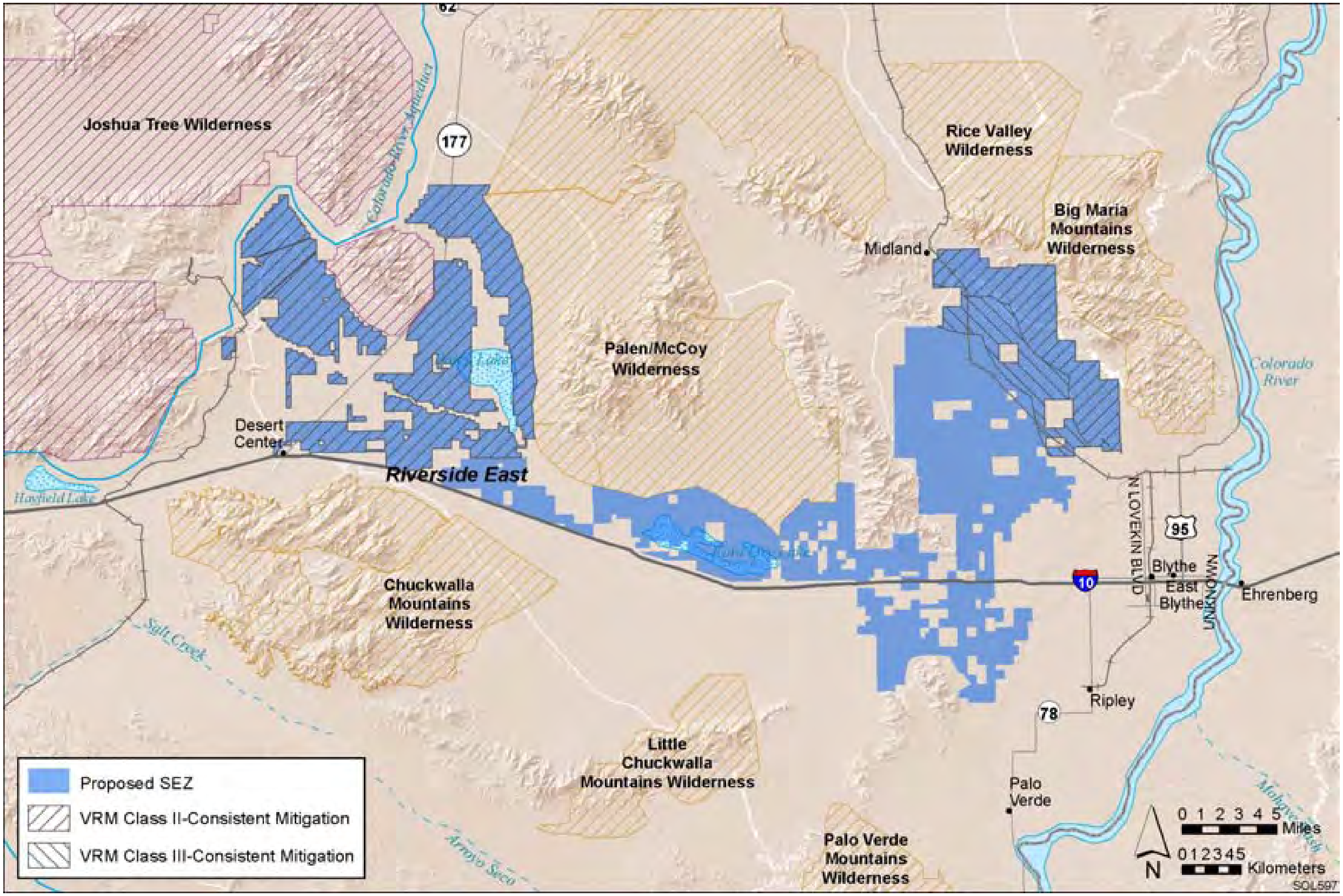

FIGURE 9.4.14.3-1 Areas within the Proposed Riverside East SEZ Affected by SEZ-Specific Distance-Based Visual Impact Design Features

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9.4.15 Acoustic Environment

9.4.15.1 Affected Environment

The proposed Riverside East SEZ is in the eastern portion of Riverside County in southeastern California. Riverside County has established noise standards based on affected land use and time of day (County of Riverside 2010). Noise standards applicable to solar energy development in the Riverside East SEZ are those established for rural environments: 45 dBA L_{eq} for both daytime and nighttime. In Riverside County, construction noise sources located within 0.25 mi (0.4 km) from an inhabited dwelling are exempt if construction does not occur between 6 p.m. and 6 a.m. from June through September and between 6 p.m. and 7 a.m. from October through May.

I-10 runs east-west along the southern edge of the western and central portions of the SEZ and passes through the eastern portion of the SEZ, while State Route 177 passes southwest–northeast through the western portion of the SEZ. The Arizona and California Railroad passes north–south through the eastern portion of the SEZ and another railroad runs north–south to the west of the western SEZ boundary. That railroad starts from the now-defunct Eagle Mountain iron mine and connects to the UP Railroad near the Salton Sea. There are three airports around the SEZ: Desert Center Airport, surrounded by the western parcels of the SEZ; Blythe Airport, located about 1.5 mi (2.4 km) east of the easternmost SEZ boundary; and the privately owned W R Byron Airport (about 6 mi [10 km] northeast of Blythe Airport), located about 1.5 mi (2.4 km) east of the easternmost SEZ boundary. Because tourism is a major industry in the area, other industrial activities are relatively minimal. Irrigated agricultural activities are scattered over the western portion of the SEZ, and high-density/large-scale agricultural activities exist to the east in Blythe. Many sensitive receptors are located within a short distance of the proposed Riverside East SEZ. Sensitive receptors such as schools or churches exist around the southwestern SEZ in Lake Tamarisk, and a hospital is located within 2 mi (3 km) east of the easternmost SEZ boundary. Many residences (mostly farms) are scattered along the western and eastern SEZ boundary. A cluster of employee residences at Eagle Mountain Pumping Station is located about 0.6 mi [1 km] west of the western SEZ boundary, and residences in Lake Tamarisk are adjacent to the southwestern SEZ boundary. Population centers with schools include Desert Center, which is located at the southwestern edge of the SEZ, and Blythe, located about 5 mi (8 km) east of the eastern SEZ boundary. Therefore, noise sources around the SEZ include road traffic, railroad traffic, aircraft flyover, agricultural activities, and activities and events at nearby residences. Background noise levels would be relatively high along I-10 and State Route 177 and around airports, while noise levels are similar to wilderness natural background levels at portions of the SEZ far from roads, airports, and agricultural activities, mostly the northern portions of the SEZ. To date, no environmental noise survey has been conducted around the Riverside East SEZ. On the basis of the population density, the day-night average sound level (L_{dn} or DNL) is estimated to be 45 dBA for Riverside County, which is on the high end for a rural area[12] (Eldred 1982; Miller 2002).

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[12] Rural and undeveloped areas have sound levels in the range of 33 to 47 dBA L_{dn} (Eldred 1982). Typically, the nighttime level is 10 dBA lower than the daytime level, and it can be interpreted as 33 to 47 dBA (mean 40 dBA) during daytime hours and 23 to 37 dBA (mean 30 dBA) during nighttime hours.

9.4.15.2 Impacts

Potential noise impacts associated with solar projects in the Riverside East SEZ would occur during all phases of the projects. During the construction phase, potential noise impacts associated with operation of heavy equipment and vehicular traffic on several nearby residences (adjacent to the western SEZ boundary) would be anticipated, albeit of short duration. During the operations phase, potential impacts on nearby residences would be anticipated, depending on the solar technologies employed. Noise impacts shared by all solar technologies are discussed in detail in Section 5.13.1, and technology-specific impacts are presented in Section 5.13.2. Impacts specific to the Riverside East SEZ are presented in this section. Any such impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2, and through the application of any additional SEZ-specific design features (see Section 9.4.15.3 below). This section primarily addresses potential noise impacts on humans, although potential impacts on wildlife at nearby sensitive areas are discussed. Additional discussion on potential noise impacts on wildlife is presented in Section 5.10.2.

9.4.15.2.1 Construction

The proposed Riverside East SEZ has a relatively flat terrain; thus, minimal site preparation activities would be required, and associated noise levels would be lower than those during general construction (e.g., erecting building structures and installing equipment, piping, and electrical). Solar array construction would also generate noise, but it would be spread over a wide area.

For the parabolic trough and power tower technologies, the highest construction noise levels would occur at the power block area; a maximum of 95 dBA at a distance of 50 ft (15 m) is assumed, if impact equipment such as pile drivers or rock drills is not being used. Typically, the power block area is located in the center of the solar facility, at a distance of more than 0.5 mi (0.8 km) to the facility boundary. Noise levels from construction of the solar array would be lower than 95 dBA. When geometric spreading and ground effects are considered, as explained in Section 4.13.1, noise levels would attenuate to about 40 dBA at a distance of 1.2 mi (1.9 km) from the power block area. This noise level is typical of daytime mean rural background level. In addition, mid- and high-frequency noise from construction activities is significantly attenuated by atmospheric absorption under the low-humidity conditions typical of an arid desert environment and by temperature lapse conditions typical of daytime hours; thus noise attenuation to background levels would occur at distances somewhat shorter than 1.2 mi (1.9 km). If a 10-hour daytime work schedule is considered, the EPA guideline level of 55 dBA L_{dn} for residential areas (EPA 1974) would occur at about 1,200 ft (370 m) from the power block area, which would be well within the facility boundary. For construction activities occurring near the residences adjacent to western SEZ boundary, estimated noise levels at the nearest residences would be about 74 dBA,[13] which is well above the Riverside County standard of 45 dBA

[13] Typically, the heavy equipment operators would not allow public access any closer than 330 ft (100 m) for safety reasons. In other words, construction and solar facility would not occur within this distance from the nearest residence.

daytime L_{eq} for rural environments. In addition, an estimated 70 dBA L_{dn}[14] at this receptor is well above the EPA guideline of 55 dBA for residential areas.

It is assumed that a maximum of three projects at any one time would be developed for SEZs larger than 30,000 acres (121.4 km^2) such as the Riverside East SEZ. If all three projects were to be built within the SEZ near the residences in the western SEZ boundary, noise levels would be only a little higher than the above-mentioned values, because the second and third construction sites would be far from the first construction site due to the irregular shape of the SEZ. Under this construction scenario assumption, combined noise levels would be less than a noticeable increase of about 3 dBA over those for a single project.

In addition, noise levels were estimated at the specially designated areas within 5-mi (8-km) from the Riverside East SEZ, which is the farthest distance that noise except extremely loud noise can be discernable. There are several specially designated areas within the range where noise might be an issue: Joshua Tree WA, Palen/McCoy WA, Rice Valley WA, Big Maria Mountains WA, Mule Mountains ACEC, Chuckwalla DWMA, and Alligator Rock ACEC. These areas abut the Riverside East SEZ, except Rice Valley WA and Alligator Rock ACEC, which are located about 0.5 mi (0.8 km) north of the eastern SEZ and 500 ft (150 m) south of the western SEZ, respectively. For construction activities occurring near these specially designated areas, noise levels are estimated to be about 74 dBA at the locations abutting the SEZ, higher than the typical daytime mean rural background level of 40 dBA. Thus, if construction would occur near the specially designated areas, portions of those areas close to the SEZ (within approximately 1 mi [1.6 km]) could be disturbed by construction noise from the SEZ. However, sound levels above 90 dB are likely to adversely affect wildlife (Manci et al. 1988). Thus, construction noise from the SEZ is not likely to adversely affect wildlife in nearby specially designated areas, except in areas directly adjacent to the construction site.

Depending on soil conditions, pile driving might be required for installation of solar dish engines. However, the pile drivers used would be relatively small and quiet, such as vibratory or sonic drivers, rather than the impulsive impact pile drivers frequently seen at large-scale construction sites. Potential impacts on neighboring residences (just next to the western SEZ boundary) would be anticipated to be minor, except when pile driving occurs near the residences.

It is assumed that most construction activities would occur during the day, when noise is better tolerated, than at night, because of the masking effects of background noise. In addition, construction activities for a utility-scale facility are temporary in nature (typically a few years). Construction would cause some unavoidable but localized short-term noise impacts on neighboring communities, particularly for activities occurring near the western and eastern proposed SEZ boundary, close to the nearby residences.

Construction activities could result in various degrees of ground vibration, depending on the equipment used and construction methods employed. All construction equipment causes ground vibration to some degree, but activities that typically generate the most severe vibrations

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14 For this analysis, background levels of 40 and 30 dBA for daytime and nighttime hours, respectively, are assumed, which result in a day-night average noise level (L_{dn}) of 40 dBA.

are high-explosive detonations and impact pile driving. As is the case for noise, vibration would diminish in strength with distance. For example, vibration levels at receptors beyond 140 ft (43 m) from a large bulldozer (87 VdB at 25 ft [7.6 m]) would diminish below the threshold of perception for humans, which is about 65 VdB (Hanson et al. 2006). During the construction phase, no major construction equipment that can cause ground vibration would be used, and no residences or sensitive structures are located in close proximity. Therefore, no adverse vibration impacts are anticipated from construction activities, including from pile driving for dish engines.

For this analysis, the impacts of construction and operation of transmission lines outside of the SEZ were not assessed, assuming that the one or more of the existing transmission lines (ranging from 115 kV to 500 kV) located within the SEZ might be used to connect new solar facilities to the regional grid and that additional project-specific analysis would be conducted for new transmission construction or line upgrades. However, some construction of transmission lines could occur within the SEZ. Potential noise impacts on nearby residences would be a minor component of construction impacts in comparison with solar facility construction and would be temporary in nature.

9.4.15.2.2 Operations

Noise sources common to all or most types of solar technologies include equipment motion from solar tracking; maintenance and repair activities (e.g., washing mirrors or replacing broken mirrors) at the solar array area; commuter/visitor/support/delivery traffic within and around the solar facility; and control/administrative buildings, warehouses, and other auxiliary buildings/structures. Diesel-fired emergency power generators and fire water pump engines would be additional sources of noise, but their operations would be limited to several hours per month (for preventive maintenance testing).

With respect to the main solar energy technologies, noise-generating activities in the PV solar array area would be minimal, related mainly to solar tracking, if used. Dish engine technology, which employs collector and converter devices in a single unit, on the other hand, generally has the strongest noise sources.

For the parabolic trough and power tower technologies, most noise sources during operations would be in the power block area, including the turbine generator (typically in an enclosure), pumps, boilers, and dry- or wet-cooling systems. The power block is typically located in the center of the facility. On the basis of a 250-MW parabolic trough facility with a cooling tower (Beacon Solar, LLC 2008), simple noise modeling indicates that noise levels would be more than 85 dBA around the power block, but about 51 dBA at the facility boundary, about 0.5 mi (0.8 km) from the power block area. For a facility located near the southwestern corner of the SEZ (in Lake Tamarisk), the predicted noise level would be about 51 dBA at the nearest residence just next to the SEZ boundary, which is higher than the Riverside County standard of 45 dBA daytime L_{eq}. If thermal energy storage (TES) were not used (i.e., if the operation were limited to daytime, 12 hours only[15]), the EPA guideline level of 55 dBA (as L_{dn}

15 Maximum possible operating hours at the summer solstice, but limited to 7 to 8 hours at the winter solstice.

for residential areas) would occur at about 1,370 ft (420 m) from the power block area and thus would not be exceeded outside of the proposed SEZ boundary. At the nearest residences, noise levels of about 49 dBA L_{dn} would be estimated, which is below the EPA guideline. As for construction, if three parabolic trough and/or power tower facilities were operating around the residences in the western portion of the SEZ, combined noise levels would be a little higher than the above-mentioned values, below a just-noticeable increase of about 3 dBA over a single facility. However, day-night average sound levels higher than those estimated above by using the simple noise modeling would be anticipated if TES were used during nighttime hours, as explained below and in Section 4.13.1.

On a calm, clear night typical of the proposed Riverside East SEZ setting, the air temperature would likely increase with height (temperature inversion) because of strong radiative cooling. Such a temperature profile tends to focus noise downward toward the ground. There would be little, if any, shadow zone[16] within 1 or 2 mi (2 or 3 km) of the noise source in the presence of a strong temperature inversion (Beranek 1988). In particular, such conditions add to the effect of noise being more discernable during nighttime hours, when the background levels are the lowest. To estimate day-night average sound levels (L_{dn}), 6-hour nighttime generation with TES is assumed after 12-hour daytime generation. For nighttime hours under temperature inversion, 10 dBA is added to sound levels estimated from the uniform atmosphere (see Section 4.13.1). On the basis of these assumptions, the estimated nighttime noise level at the nearest residences (about 0.5 mi [0.8 km]) from the power block area for a solar facility located near the southwestern SEZ boundary) would be 61 dBA L_{eq}, which is much higher than Riverside County regulation of 45 dBA nighttime L_{eq}. The day-night average noise level is estimated to be about 63 dBA L_{dn}, which is higher than the EPA guideline of 55 dBA for residential areas. The assumptions are conservative in terms of operating hours, and no credit was given to other attenuation mechanisms, so it is likely that sound levels would be lower than 63 dBA at the nearby residences in Lake Tamarisk, even if TES is used at a solar facility. If three parabolic trough and/or power tower facilities are operating around the nearby residences in the southwestern portion of the SEZ, combined noise levels would be a little higher than these values, as explained above, but lower than a just-noticeable increase of about 3 dBA over a single facility. Consequently, operating parabolic trough or power tower facilities with TES and located near the southwestern SEZ boundary could result in sound levels above the noise standard or guideline, and adverse noise impacts could occur at the nearest residences. In the permitting process, refined noise propagation modeling would be warranted along with measurement of background sound levels.

Associated with operation of a parabolic trough or power tower solar facility occurring near the specially designated areas, the estimated daytime level of 51 dBA at the boundary of these areas is higher than the typical daytime mean rural background level of 40 dBA, while the estimated nighttime level of 61 dBA is much higher than the typical nighttime mean rural background level of 30 dBA. However, operation noise from a parabolic trough or power tower solar facility with TES is not likely to adversely affect wildlife at the nearby specially designated areas (Manci et al. 1988).

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16 A shadow zone is defined as the region in which direct sound does not penetrate because of upward diffraction.

The solar dish engine is unique among concentrating solar power (CSP) technologies, because it generates electricity directly and does not require a power block. A single, large solar dish engine has relatively low noise levels, but a solar facility might employ tens of thousands of dish engines, which would cause high noise levels around such a facility. For example, the proposed 750-MW SES Solar Two dish engine facility in California would employ as many as 30,000 dish engines (SES Solar Two, LLC 2008). At the Riverside East SEZ, on the basis of the assumption of dish engine facilities of up to 18,035-MW total capacity (covering 80% of the total area, or 162,317 acres [657 km^2]), up to 721,400 25-kW dish engines could be employed. Also for a large dish engine facility, several thousand step-up transformers would be embedded in the dish engine solar field, along with several substations; however, the noise from these sources would be masked by dish engine noise.

The composite noise level of a single dish engine would be about 89 dBA at a distance of 3 ft (0.9 m) (SES Solar Two, LLC 2008). This noise level would be attenuated to about 40 dBA (typical of the mean rural daytime environment) within 340 ft (105 m). However, the combined noise level from hundreds of thousands of dish engines operating simultaneously would be high in the immediate vicinity of the facility, for example, about 54 dBA at 1.0 mi (1.6 km) and 51 dBA at 2 mi (3 km) from the boundary of the square-shaped dish engine solar field, both of which are higher than the Riverside County standard of 45 dBA daytime L_{eq} for rural environments. However, these levels would occur at somewhat shorter distances than the aforementioned distances, considering noise attenuation by atmospheric absorption and temperature lapse during daytime hours. To estimate noise levels at nearby residences, it was assumed dish engines were placed all over the Riverside East SEZ at intervals of 98 ft (30 m). On the basis of this assumption, the estimated noise levels at all nearby receptors within a 2-mi (3-km) distance of the SEZ boundary would be higher than the Riverside County standard of 45 dBA daytime L_{eq} for rural environments. The noise level would decrease to the level of the Riverside County standard of 45 dBA daytime L_{eq} for rural environments at about 3 mi (5 km) from the SEZ boundary. The highest noise levels of about 59 dBA L_{eq} would be estimated for a receptor near the east central SEZ boundary. On the basis of 12-hr daytime operation, the estimated 56 dBA L_{dn} for this receptor is a little higher than the EPA guideline of 55 dBA L_{dn} for residential areas. At other receptors, 55 dBA or less L_{dn} was estimated. While this upper-limit estimate for operation of dish engines over the entire Riverside East SEZ is highly unlikely to be attained, noise levels from, for example, a single 1,000-MW facility located at the SEZ boundary would not be much lower, only about several decibels lower, because contributions to levels from dish engines at further distances would be minor. A dish engine facility near the western or eastern SEZ boundary close to the nearby residences could result in noise levels above Riverside County standard and EPA guideline levels, and could have corresponding adverse noise impacts on residents there. Noise from dish engines might be masked by background noise if a receptor is located near noisy background sources, such as highways or airports. However, noise from dish engines would have considerable impacts on receptors with low background noise levels.

For dish engines placed throughout the SEZ, the estimated highest noise level at the SEZ boundary would be about 62 dBA, which is higher than the typical daytime mean rural background level of 40 dBA. However, dish engine noise from the SEZ is not likely to adversely affect the nearby specially designated areas (Manci et al. 1988).

Consideration of minimizing noise impacts is very important during siting for dish engine facilities. Direct mitigation of dish engine noise through noise control engineering could also be considered.

During operations, no major ground-vibrating equipment would be used. In addition, no sensitive structures are located close enough to the Riverside East SEZ to experience physical damage. Therefore, potential vibration impacts on surrounding communities and vibration-sensitive structures during operation of any solar facility would be minimal.

Transformer-generated humming noise and switchyard impulsive noises would be generated during the operation of solar facilities. These noise sources would be located near the power block area, typically near the center of a solar facility. Noise from these sources would generally be limited to within the facility boundary and rarely be heard at nearby residences, assuming a 0.5-mi (0.8-km) distance (at least 0.5 mi [0.8 km] to the facility boundary and to the nearby residences). Accordingly, potential impacts of these noise sources on nearby residences would be minimal.

For impacts from transmission line corona discharge noise during rainfall events (Section 5.13.1.5), the noise level at 50 ft (15 m) and 300 ft (91 m) from the center of a 230-kV transmission line tower would be about 39 and 31 dBA (Lee et al. 1996), respectively, typical of daytime and nighttime mean background noise levels in rural environments. The noise levels at 65 ft (20 m) and 300 ft (91 m) from the center of 500-kV transmission line towers would be about 49 and 42 dBA, typical of high-end and mean daytime background noise levels, respectively, in rural environments. Corona noise includes high-frequency components, which may be judged to be more annoying than other environmental noises. However, corona noise likely would not cause impacts, unless a residence was located close to the source (e.g., within 500 ft [152 m[of a 230-kV transmission line and 0.5 mi [0.8 km[of a 500-kV transmission line). The proposed Riverside East SEZ is located in an arid desert environment, and incidents of corona discharge would be infrequent. Therefore, potential impacts on nearby residents along the transmission line ROW would be negligible.

9.4.15.2.3 Decommissioning/Reclamation

Decommissioning/reclamation requires many of the same procedures and equipment used in traditional construction. Decommissioning/reclamation would include dismantling of solar facilities and support facilities such as buildings/structures and mechanical/electrical installations; disposal of debris; grading; and revegetation as needed. Activities for decommissioning would be similar to those used for construction but on a more limited scale. Potential noise impacts on surrounding communities would be correspondingly lower than those for construction activities. Decommissioning activities would be of short duration, and their potential impacts would be moderate and temporary in nature. The same mitigation measures adopted during the construction phase could also be implemented during the decommissioning phase.

Similarly, potential vibration impacts on surrounding communities and vibration-sensitive structures during decommissioning of any solar facility would be lower than those during construction and thus minimal.

9.4.15.3 SEZ-Specific Design Features and Design Feature Effectiveness

The implementation of required programmatic design features described in Appendix A, Section A.2.2, would greatly reduce or eliminate the potential for noise impacts from development and operation of solar energy facilities. While some SEZ-specific design features are best established when project details are being considered, measures that can be identified at this time include the following:

- Noise levels from cooling systems equipped with TES should be managed so that levels at the nearby residences to the west and to the east of the SEZ are kept within applicable guidelines. This could be accomplished in several ways, for example, through placing the power block approximately 1 to 2 mi (1.6 to 3 km) or more from residences, limiting operations to a few hours after sunset, and/or installing fan silencers.

- Dish engine facilities within the Riverside East SEZ should be located more than 1 to 2 mi (2 to 3 km) from the nearby residences to the west and the east of the SEZ (i.e., the facilities should be located in other portions of the proposed SEZ). Direct noise control measures applied to individual dish engine systems also could be used to reduce noise impacts at the nearest residences.

9.4.16 Paleontological Resources

9.4.16.1 Affected Environment

The proposed Riverside East SEZ is covered predominantly by Quaternary/Tertiary deposits of varying types. The eastern half and southwestern portions are mostly composed of thick alluvial deposits (more than 100 ft [30.5 m] thick), ranging in age from the Holocene to the Pliocene. The total acreage of the alluvial deposits within the SEZ is 147,295 acres (596 km^2), or about 73% of the SEZ. The northwest and central sections are mostly composed of eolian (dune sand) and playa sediments. The total area of eolian sediments within the SEZ is 50,927 acres (206 km^2), or 25% of the SEZ, and the total area of playa sediments is 3,081 acres (12 km^2), or 2% of the SEZ. Peripheral sections of the SEZ are composed of residual materials developed in igneous and metamorphic rocks, sedimentary rocks, or carbonate rocks. These discontinuous residual deposits account for 1,788 acres (7.2 km^2), or less than 1% of the SEZ. In the absence of a PFYC map for the California Desert District, a preliminary classification of PFYC Class 3b is assumed for the alluvial, eolian, playa, and residual deposits. Class 3b indicates that the potential for the occurrence of significant fossil materials is unknown and needs to be investigated further (see Section 4.8 for a discussion of the PFYC system). On the basis of some paleontological survey work conducted within the SEZ for existing solar applications, several areas within the SEZ could be classified as PFYC Class 1. Other areas could be classified as PFYC Class 4/5, such as near Quaternary lake bed deposits. The Bouse Formation is likely to be present within the SEZ and has the potential to contain marine, brackish, and freshwater fossils, including a species of barnacle, a foraminifer, mollusks, gastropods, ostracodes, and charophytes. Well tests within the Riverside East SEZ hit the Bouse Formation at a depth of about 60 ft (18 m).

Pedestrian surveys to look for surface fossils and exposures of potential fossil-bearing geologic units were conducted for the Palen and Blythe Solar Power Projects in 2009. Five nonsignificant fossil occurrences or points were recorded for the Palen project, predominantly consisting of petrified wood and one possible mammal jaw fragment from the surface of Quaternary deposits. In addition to the field reconnaissance, a records search indicated that the potential for subsurface deposits of paleontological material ranged from low to high, increasing with depth. A portion of the Palen project was identified as having a high sensitivity for containing significant paleontological resources in areas of Quaternary lakebed deposits. The recommendation of the report is to monitor ground disturbances in Quaternary lakebed deposits, due to their sensitivity, on a full-time basis and to prepare a Paleontological Resource Monitoring and Mitigation Plan for the project.

For the Blythe project, 37 nonsignificant fossil occurrences of petrified wood were recorded, in addition to 64 nonsignificant fossil points of turtle shell fragments, vertebrate fragments, and invertebrate specimens. Several portions of the Blythe project area, including areas of alluvial deposits in the McCoy Wash and Palo Verde Mesa areas and older alluvial fan and alluvial valley deposits, have been identified as having high sensitivity for containing possible significant subsurface paleontological resources. Quaternary alluvium deposits of modern washes range in sensitivity from low to high, increasing sensitivity with depth. The recommendation of the report is to prepare a Paleontological Resource Monitoring and

Mitigation Plan for the project and monitor ground disturbance in all areas of high sensitivity, including areas of low to high sensitivity when ground disturbances equal or exceed 5 ft (1.5 m) in depth.

9.4.16.2 Impacts

The potential for impacts on significant paleontological resources at the Riverside East SEZ is relatively unknown, but the potential is high in some areas. A more detailed investigation of the local geological deposits of the SEZ and their potential depth is needed prior to project approval. Once a project area has been chosen, a paleontological survey will likely be needed following consultation with the BLM. The appropriate course of action would be determined as established in BLM IM2008-009 and IM2009-011 (BLM 2007b, 2008a). Section 5.14 discusses the types of impacts that could occur on any significant paleontological resources found to be present within the Riverside East SEZ. Impacts will be minimized by implementing applicable general mitigation measures from Section 5.14, such as paleontological monitoring and development of a management/mitigation plan, and required programmatic design features described in Appendix A, Section A.2.2.

Indirect impacts on paleontological resources outside of the SEZ, such as through looting or vandalism, are unknown but unlikely because any such resources would be below the surface and not readily accessed. Programmatic design features for controlling water runoff and sedimentation would prevent erosion-related impacts on buried deposits outside of the SEZ.

No new roads or transmission lines have been assessed for the proposed Riverside East SEZ, assuming existing corridors would be used; impacts on paleontological resources related to the creation of new corridors would be evaluated at the project-specific level if new road or transmission construction or line upgrades are to occur.

A programmatic design feature requiring a stop work order in the event of an inadvertent discovery of paleontological resources would reduce impacts by preserving some information and allowing possible excavation of the resource, if warranted. Depending on the significance of the find, it could also result in some modification to the project footprint. Since the SEZ is located in an area preliminarily classified as PFYC Class 3b or greater, a stipulation would be included in permitting documents to alert solar energy developers of the possibility of a delay if paleontological resources were uncovered during surface-disturbing activities.

9.4.16.3 SEZ-Specific Design Features and Design Feature Effectiveness

Impacts would be minimized through the implementation of required programmatic design features, including a stop-work stipulation in the event that paleontological resources are encountered during construction, as described in Appendix A, Section A.2.2. The need for and the nature of any SEZ-specific design features would depend on findings of paleontological surveys.

9.4.17 Cultural Resources

9.4.17.1 Affected Environment

9.4.17.1.1 Prehistory

The proposed Riverside East SEZ is located in a transitional area between the Colorado Desert to the south and the Mojave Desert to the north. The earliest human use of the Colorado and Mojave Deserts was likely during the Paleoindian Period, sometime between 12,000 and 10,000 B.P. Although no Paleoindian sites have been documented in the Colorado Desert, several sites have been documented in the Mojave Desert, and in coastal sites to the west. These known sites are predominantly located near inland pluvial lakes (now mostly dry), and on desert terraces, suggesting that subsistence during this time period focused on mega-fauna and on the local lake and marsh habitats. This hunting-intensive period came to an end around 7,000 to 8,000 B.P., when the mega-fauna became extinct, likely due to intensive hunting and a warming climate; this warming climate consequently led to the shrinking of ancient pluvial lakes. These early sites are characterized by the Clovis complex of fluted points, and later the San Dieguito complex, characterized by core and flaked-based tools, crescents, choppers, planes and scrapers, and some leaf-projectile points (Rogers 1939; Jones and Klar 2007).

The Archaic Period in the Colorado Desert lasted from approximately 8,000 to 1,500 B.P., defined mainly by the Pinto Cultural Complex. The paucity of evidence during the Archaic time period in the Colorado Desert makes it difficult to establish secure chronological sequences, making the Archaic period of the Colorado Desert an important source for regional research questions. The sites during this time period are generally identified by the material culture, distinctive projectile points, and ground stone tools used for processing plant resources. However, some of the Late Archaic sites in the region, mainly found on the margins of the Colorado Desert or around ancient Lake Cahuilla to the southeast of the SEZ, have been identified by buried midden deposits with clay-lined features, cremations, thermal features (such as fire-affected rock and hearths), and perishable items such as basketry, nets, traps, and split-twig figurines (Love and Dahdul 2002; Jones and Klar 2007).

The Late Prehistoric/Protohistoric Period began about 1500 B.P. and extended until contact with European explorers and colonization of the area. The archaeological Patayan complex is thought to be ancestral to the later Yuman cultural groups discussed in Section 9.4.17.1.2. The Late Prehistoric period likely saw a change in subsistence patterns from the preceding Archaic period as Lake Cahuilla recessed, forcing groups to rely on floodplain agriculture and the seasonal flooding of the Colorado River. While agriculture played a large role in their diet, these groups likely maintained some of their hunting and gathering subsistence practices, practicing a mix of horticultural and hunter-gatherer subsistence strategies. The Late Prehistoric period also saw the introduction of pottery, buff and brown ware ceramics, and paddle and anvil pottery, likely introduced from Mexico. Archaeological assemblages of the period are also characterized by bow-and-arrow technology, evidenced by smaller Cottonwood and Desert side-notched points; a shift in burial practices from inhumation to cremation techniques; rock art and intaglios; bedrock milling features; and an extensive system of trails, along which "pot-drops," lithic debitage, and shrines are found.

9.4.17.1.2 Ethnohistory

Although of diverse linguistic stock, the Native Americans that inhabited the southeastern California deserts when Euro-Americans first arrived shared similar ways of life and broadly similar beliefs, norms, and values (Halmo 2003). The mountains and valleys of their shared environment provided a variety of seasonally available resources. Native American groups harvested these resources following a regular seasonal pattern. They lived in kin-based groups, or lineages, that would join together or split apart depending on the type and the abundance of the resources available. A pattern of seasonal camps combined with permanent villages emerged. Lineages tended to consider specific highly productive areas, such as dense stands of mesquite, as their own, while the areas between were shared not only with other lineages, but also with other Tribes (Lightfoot and Parish 2009). Even when they grew wild, plant resources were often managed; stands of plant resources might be pruned, watered, or burned to encourage growth. The pattern of seasonal migration to exploit particular resources allowed the groups to adapt to changes in their subsistence base with the arrival of new cultural impulses and populations. Floodplain horticulture, adopted from the Southwest, allowed for the establishment of permanent, often multi-ethnic villages along the Colorado River (Halmo 2003). These became part of the migratory pattern which continued to take some ethnic groups into the highlands to harvest resources available there. Similarly, with the discovery of gold in the 19th century and the influx of Euro-American populations in the 20th century, Native Americans added wage labor in mines and on large irrigated farms to their seasonal rounds (Bean et al. 1978).

The various Native American ethnic groups that inhabited the southeastern California deserts each had an area that they considered their homeland, but the boundaries between these areas were not sharply drawn. Travel to hunt, trade, or just visit neighboring groups was common (Kelly and Fowler 1986). The territorial claims of the different ethnic groups who occupied the Mojave and Colorado Deserts overlap each other. The boundaries between ethnic groups appear to have changed from one time period to another, and groups would sometimes share territory, or a group would invite its neighbors to share an abundant resource (CSRI 2002). In addition, many of the ethnic groups that inhabited the Colorado Desert shared a considerable amount of ritual and worldview, including an important religious song cycle sung in the language of the Mohave. This song cycle was associated with a network of trails, the most important of which are the *Xam Kwatcan* Trail (Johnson 2003) and the Salt Song Trail (Halmo 2003). These trails are both physical and spiritual paths, connecting sacred natural features thought to be imbued with power. Following the trails physically or in spirit was particularly important as part of a mortuary ritual to aid the departed in their journey to the afterlife. Points along the trail are often marked with cairns, sometimes covering burials, cleared sleeping circles, panels of petroglyphs, and in some areas geoglyphs or intaglios. Campsites along the trails are most often associated with springs (CSRI 1987). Other trails were of secular importance, reflecting a web of social and trade links that stretched from the Pacific coast to the Great Plains. As discussed in Section 9.4.18.1, the Native Americans living in southeastern California tend to view the landscape they inhabit holistically, each part intrinsically and inextricably connected to the whole. In some sense, the network of trails tied the landscape together.

The proposed Riverside East SEZ lies in an area of intermittent joint use. It provided seasonal resources to surrounding groups and included important trails that connected them (Knack 1981). The Takic-speaking Serrano were centered in the mountains to the west; the closely related Cahuilla in the Coachella Valley; the Yuman-speaking Quechan at the confluence of the Colorado River and the Gila; their allies, the Mohave, along the river from Blythe to Black Canyon; and the Numic-speaking Chemhuevi in the Chemehuevi Valley and parts of the Mojave Desert. Before the early 19th century, the Halchidhoma lived along the river around what is now Blythe.

Serrano

The precise sociopolitical boundaries of the Serrano are difficult to define (Kroeber 1925; Strong 1929). Their name is derived from a Spanish term meaning “highlander” or “mountaineer.” Most researchers place the Serrano homeland in the San Bernardino Mountains east of the Cajon Pass, and in the Mojave River drainage north of Victorville. They themselves place their traditional center of origin at Twentynine Palms (CSRI 2002).

The Serrano were a collection of localized lineages speaking the same language and sharing the same culture, but with little or no overarching political structure. They had cultural ties to the Vanyume on the north and Cahuilla on the south. The Serrano appear to have been primarily gatherers, supplementing their plant-based diet with hunting and fishing. There is considerable variation in altitude within their traditional range, and as with neighboring groups, resources were collected from a number of environments. Most villages were found in the foothills, but some occurred on the desert floor in locations where good water was available. At higher elevations they gathered piñon nuts and acorns, and at lower elevations mesquite pods and yucca heads. The harvests were stored, and excess traded. Where the resource was abundant, lineages might gather to harvest or to communally hunt rabbits or deer (Bean and Smith 1978).

Limited by water supply, villages were small, consisting of clusters of tule-thatched, domed, circular huts. Most often they also included a larger ceremonial structure where the lineage leader lived. Their material culture included decorated baskets, pottery, hide blankets, stone pipes, yucca fiber cordage, and an assortment of musical instruments of wood, bone, and shell, similar to the material culture of the Cahuilla (Farmer et al 2009).

The Serrano had little contact with the Spanish until 1819 when an *asistencia*, or mission outpost, was established near Redlands. Thereafter, native ways of life rapidly faded as the majority of the population was moved to the missions. By the latter part of the 20th century, most Serrano lived on the Morongo and San Manuel reservations, where they mixed with the Cahuilla and other ethnic groups (Bean and Smith 1978).

Cahuilla

Closely related to and associated with the Serrano, the Cahuilla occupied the Coachella Valley. Like the Serrano, their society was composed of lineage-based groups with hereditary leaders, but with no overarching sociopolitical organization. They are believed to have entered the Colorado Desert from the Great Basin sometime between 500 BC and AD 500. They were hunters and gatherers who lived in permanent villages near reliable water. They appear to have first settled on the shores of Lake Cahuilla,[17] and then moved to the mountains as the lake dried. The Cahuilla tended toward larger groups that consisted of multiple lineages (Lightfoot and Parish 2009). Preferred settlement sites were near mesquite stands or palm oases. They considered the latter to be sacred (Bean et al 1978). While villages were occupied year-round, small groups would move seasonally to temporary camps to collect localized plant resources or to hunt. Larger groups would travel to the mountains together with mountain allies to harvest piñon nuts and acorns. These would be brought to the permanent villages for storage. Species important to the Cahuilla are discussed in Section 9.4.18.

The Cahuilla were long-distance traders. The routes westward through San Gorgonio Pass to the coast lay within their traditional use area, and the Cahuilla maintained trading relationships east of the Colorado River with the Maricopa. Like the Chemehuevi, they were part of a network that stretched as far east as the Great Plains (Bean et al 1978). A major east–west trade route referred to as the “Cocomaricopa” or “Halchidhoma Trail” connected the San Gorgonio Pass with the Gila River area and crossed the Colorado River near present-day Blythe. I-10 roughly follows the northern branch of the trail from Blythe westward to Desert Center (Cleland and Apple 2003). The Cahuilla would have been familiar with the southern portions of the proposed Riverside East SEZ.

Quechan

Sometimes referred to as the Yuma, the Quechan (Kwatsan) are a Yuman-speaking group closely allied with the Mohave, traditionally centered at the confluence of the Gila and Colorado Rivers. It is not clear when they arrived at the confluence. They were there by the 1770s, but were not mentioned by Francisco Vasquez de Coronado, who passed through the area in 1540. Quechan tradition relates that the Tribe migrated south from the sacred mountain *Avikwaame*, in the Newberry Mountains near Laughlin, Nevada. They are thought to have arrived at the confluence sometime between the thirteenth and the eighteenth centuries. Traditionally, the Quechan practiced floodplain horticulture, depending on the annual floods of the Colorado River to replenish their fields with fresh silt. The fertility of the soil allowed multiple plantings and harvests, which the Quechan supplemented by gathering plants from the desert and by fishing. During the growing season they dispersed along the floodplains of the Colorado and the Gila Rivers, moving to the upper terraces during the winter. The Quechan prospered using simple

[17] Lake Cahuilla formed when the Colorado River shifted course to the west and flowed into the Salton Sea Basin, then dried when the river reverted to its former course. The process of formation and desiccation was cyclical before the construction of dams on the Colorado, with cycles lasting about 150 years (Redlands Institute 2002).

technology. Their bows were simple and unbacked. Arrows often had no stone points. Digging sticks served for planting maize, and clothing was minimal (Bee 1983).

While their settlements were more dispersed and independent than those of the Serrano or the Cahuilla, the Quechan had a sense that they were a Tribe, a nation occupying a specific territory. They acted together in warfare; acting together with their allies, the Mohave, they were often at odds with the Halchidhoma, the Maricopa, and the Cocopah.

The confluence of the Gila and Colorado Rivers was an important crossing along the Yuma-San Diego Trail, which led to the coast. Important to the Spanish, and later the Americans, the Spanish established a mission there in 1779 only to have it destroyed by the Quechan and Cahuilla 2 years later. The Hispanic connection remained important to the Quechan, who desired Spanish trade goods, for which they exchanged slaves captured during raids on their enemies (Knack 1981). Between 1826 and 1829 the Quechan joined the Mohave in driving out the Halchidhoma, who controlled another important river crossing. For a time, some Quechan moved into the Blythe area, but they had returned south by the second half of the nineteenth century (Bee 1983). After the defeat of Mexico in 1848, the United States established at fort at Yuma to control the crossing, which had become an important wagon road. A reservation was established for the Quechan in 1884.

Like that of their northern neighbors, Quechan cosmology included ritually important trails. The most important of these remains the *Xam Kwatcan* Trail. It follows the Colorado River, connecting Pilot Knob (*Avikwalali*) with Spirit Mountain (*Avikwaame*), connecting a series of ritually important places of power. One of these is Palo Verde Peak, located about 12 mi (19 km) south of the SEZ (Johnson 2003).

Mohave

The Mohave were primarily at home along the Colorado River, from time to time occupying its banks as far south as Blythe. They appear to have entered the Mojave Valley sometime around AD 1150. They resided chiefly along the eastern bank of the Colorado River, but travelled widely, for trade, to harvest seasonally available resources, and out of curiosity. They are likely to have been familiar with Chuckwalla Valley and lands included in the proposed Riverside East SEZ. They lived in sprawling settlements, rather than villages, with houses situated on low hills above the flood plain. They did not engage in irrigation agriculture, but relied on seasonal inundation to water and refresh their fields. Unlike most other Colorado Desert Tribes, families owned individual fields and individual mesquite trees (Stewart 1983). Most of the year the Mohave lived on terraces above the Colorado River, moving to the flood plain in the spring to plant crops after seasonal floods receded (Kroeber 1925).

The Mohave have traditionally thought of themselves as a nation inhabiting a territory under a hereditary great chief of the Malika clan. Divided into patrilineal clans, they came together for warfare and other purposes. War leaders and shamans had great influence, and power was gained by dreaming, often in sacred locations. Their territorial claims are extensive, reflecting their propensity to travel. They claim as their territory a much larger range than other

California Tribes, including all of the Mojave Desert and as far south as the Turtle, Granite, and Eagle Mountains (CSRI 2002), adjacent to, but not including the SEZ. This larger range was where they hunted and gathered to supplement their planted crops and the fish they took from the river. They are likely to have traded, hunted, and gathered in the Riverside East SEZ area. They were less reliant on hunting and gathering than the Chemehuevi, who hunted and gathered in much of the same area (Farmer et al. 2009).

Besides being used for travel for trade, war, and recreation, trails often had religious significance. The Salt Song Trail, which passes through the SEZ, seems to have originated with the Mohave. The Mohave revere other trails, such as the Keruk Trail of Dreams. The song cycles that are associated with the trails tied specific songs to specific places. Many of these were considered places of power, where individuals sought enlightenment, skills, and status through dreaming. These trails are considered sacred, and offerings continue to be left at sacred points along them (Halmo 2003).

Halchidhoma

The Halchidhoma were a Yuman-speaking group who were once located south of the Mohave along the Colorado River. Like the Mohave, they were floodplain cultivators and active traders. Culturally, they were similar to the Mohave and the Quechan, but politically they were their enemies. Their ties were with the Maricopa and Cocopah, also Yuman speakers. Like the Mohave, they were great travelers and traders, establishing the Cocomaricopa or Halchidhoma Trail, and an east–west route later followed by Euro-American immigrants. Their clashes with the Mohave and Quechan came to a head sometime around 1825. The Halchidhoma were defeated and began to move to the Gila River to join their Maricopa allies. This process continued until about 1840 (Harwell and Kelly 1983).

Chemehuevi

The Chemehuevi, a Southern Paiute group, occupied the Parker and Blythe Valleys along the Colorado at the invitation of the Mohave, with whom they were allied, sometime between 1825 and 1830, after the Mohave and Quechan had driven out the Halchidhoma. In the late 1860s, hostilities erupted between the Mohave and Chemehuevi, and part of the Chemehuevi moved west to join Cahuilla and Serrano villages near Twentynine Palms. In 1874, the Office of Indian Affairs set aside part of the Mohave reservation along the Colorado River for the Chemehuevi, but many did not want to return. In 1907 a separate reservation was established north of Parker, Arizona (Kelly and Fowler 1986).

The Chemehuevi ranged through the eastern half of the Mojave Desert, but were concentrated along the Colorado River, where they adopted flood plain agriculture, and the Chemehuevi Valley away from the river, where they retained their ties to the surrounding upland mountains and valleys. The latter have been called Desert Chemehuevi (*Tiiranniwiwi*) (Farmer et al. 2009). Even those living along the river retained more reliance on hunting and gathering than their neighbors. The Tiiranniwiwi may have been periodically present in the

Riverside East SEZ, although it is somewhat south of their claimed traditional Tribal use area. Taken together, they had a diverse subsistence base including irrigated mixed horticulture, wild plant management, and hunting. Normally they produced a surplus that they were able to trade (Halmo 2003).

Chemehuevi settlements were scattered and band size varied with the season and available water, plant, and animal resources. Dwellings varied from pole structures covered with brush, to rock shelters, to earth-covered huts often with open fronts, adopted from the Mohave. Other items of Mohave material culture were likewise adopted, including ceramic styles, square metates (grinding stones), storage platforms, and personal adornment (Farmer et al. 2009).

The relations between the Chemehuevi and neighboring Tribes were mostly amicable. They maintained a trading relationship with the Cahuilla, and groups of Chemehuevi would travel as far west as the coast to trade for shells and as far east as the Hopi mesas. They were involved in a trade network that stretched from the Channel Islands to the Gila River Valley and the Great Plains, with the potential to bring material culture from some distance away to the Chemehuevi homeland.

9.4.17.1.3 History

European explorers first entered the southeastern California deserts in the sixteenth century. Early explorers of Alta, California, reached the Colorado River by way of the Gulf of California, and proceeded up the stream past the confluence of the Gila River, but explored little of the interior deserts. For the next 200 years Spanish penetration of the interior deserts was intermittent, resulting in a prolonged protohistoric period (see Sections 9.4.17.1.1 and 9.4.17.1.2). Juan Bautista de Anza crossed the Colorado River with the assistance of the Quechan on his way to Monterey in 1774. His route, which is located well south of the proposed Riverside East SEZ near the border of California and Mexico, became the main travel corridor between Arizona and central California in the 1800s. Another trail, the Cocomaricopa Trail, passed through the SEZ; it began as a Native American trail and later served as the mail route between Sonora, Mexico, and Alta, California. The trail's name changed to Bradshaw Trail over time, as William Bradshaw established an overland stage route using the trail in an effort to attract miners to the area.

The nineteenth and early twentieth centuries were characterized by mining and prospecting in the Colorado Desert. Gold, silver, copper, gypsum, borax, and manganese were the primary deposits of interest. A series of military camps and forts were established in Arizona, Nevada, and California between 1848 and 1890 to protect those moving into the area from hostile Tribes; tensions had increased between settlers and Native Americans as a result of the estimated 8,000 immigrants to the area during the Gold Rush. In addition to the trail initially established by de Anza, Jedediah Smith created a new trail into California in 1826 that passed through present day Needles, well north of the SEZ. In 1877, gold prospector Thomas Blythe established water rights along the Colorado River in an effort to promote and establish a town bearing his name, located just east of the SEZ. This new development in the deserts was dependent on water and transportation. In 1872, the Southern Pacific Railroad started toward

California; by 1877, it extended to Yuma, Arizona, and by 1880 it had reached the Chocolate Mountains southeast of the SEZ. The Eagle Mountain Mine, located immediately west of the SEZ and north of Desert Center, operated as a gypsum and iron mine until 1983, and a 52 mi (84 km) rail line connected the mine with the Southern Pacific Railroad at Duramid. Production at the mines in the area increased during both World Wars as the need for metals (iron, gold, silver, manganese, and gypsum) increased. In addition to the Eagle Mountain Mine, mining prospects are known in the Mule Mountains, Big Maria Mountains, McCoy Mountains, and Palen Mountains, all of which are ranges located in very close proximity to the proposed Riverside East SEZ. Water did not come to the Colorado Desert until the 1930s when the MWD was created and work began on the CRA extending from Parker Dam to Los Angeles; it was completed in 1938. Associated with the construction of the aqueduct were several roads and transmission lines, as well engineering camps, one of which was built at the Eagle Mountain pump lift.

In 1942, the U.S. Army identified 18,000 mi^2 (46,000 km^2) of desert in California and Arizona for training troops in a desert environment in preparation for combat in North Africa. The area came to be known as the Desert Training Center/California-Arizona Maneuver area, or DTC/C-AMA, in 1943 as the massive training facility expanded its size to 31,500 mi^2 (81,600 km^2) and its range of activities from training troops, testing and developing equipment and supplies, and developing new techniques and tactics for desert warfare to large-scale training and maneuvering. It is estimated that over 1,000,000 men trained at the DTC/C-AMA. Although it only operated between 1942 and 1944, it represents a significant period in U.S. history and includes a number of archaeological features of importance, including the remains of training camps, airfields, bivouacs, maneuver areas, and tank tracks (Bischoff 2000).

In a larger context, the DTC was a part of the early days of U.S. involvement in WWII. The German army was advancing across Europe and the Italian army had struck out in Libya and Egypt. British forces had been able to successfully counterattack the Italian army, but this resulted in Germany entering North Africa to help the Italians. General Erwin Rommel of the German army was successful with his desert army advancing across Libya and then into Egypt against the British. The prospect of Germany and Italy controlling Egypt and the Japanese successes in India, propelling them toward Persia, leaving Russia wide open to attack, made it clear to the U.S. that they would need to go to North Africa. General Lesley J. McNair, chief of staff for the Army General Headquarters, recognized the need to prepare American soldiers for desert warfare in a terrain similar to that of North Africa. He placed Major General George S. Patton, Jr., who had previously conducted successful training maneuvers in Louisiana, in charge of the desert training center project (Bischoff 2000).

The location of the DTC was determined in March of 1942, as General Patton toured the desert. Aside from the mountain ranges, the uninhabited desert of eastern California was deemed sufficiently similar to that of North Africa. Patton felt the area was ideal for large-scale training exercises because it was remote and desolate, but water was available and three railroads supplied the area. In addition, there were other military facilities nearby (in Riverside, Las Vegas, Indio, Yuma, and Blythe). Patton worked out deals with the railroad companies (Union Pacific, Santa Fe, and Southern Pacific) and the Municipal Water District in order to supply transportation and water for the troops. Camp Young was the first camp established near

Blythe, and it became the DTC headquarters. Several other camps were constructed over the course of the DTC/C-AMA operation. The camps were temporary in nature, constructed mostly of tents with some wooden structures to house administrative centers or hospitals. The only permanent construction consisted of open-air chapels and large relief maps. Associated with most of the camps were maneuver areas, rock-lined insignias, and arms ranges. By late summer of 1942, Patton was ordered to North Africa, where he successfully commanded the western task force of the operation to victory under Operation Torch. The DTC was quickly placed under the command of Major General Alvan Gillem and the first set of maneuvers was conducted in the fall. This first set of maneuvers was considered unrealistic, and the DTC was ordered to operate like a theater of operations in a combat setting, including establishing communication zones and combat zones. This was the first time the Army had simulated a theater of operation. Riverine operations across the Colorado River were also added. At its height the DTC contained 14 camps, with 11 in California and 3 in Arizona, each capable of holding at least 15,000 soldiers during a typical 14-week training schedule. There were also airfields, hospitals, supply depots, and railheads. Several airfields were located in close proximity to the SEZ: Shaver's Summit, located near Chiriaco, the Desert Center Army Airfield, and Rice Army airfield, located north of the Riverside East SEZ. The importance of air support should not be overlooked, as it was seen as an integral part of the desert training experience. On-the-ground troops needed to be able to conceal themselves as much as possible to prevent detection during simulated air attacks. In 1943, as the need for desert training waned with the close of the North African campaign, the concept and name of the DTC changed to the California-Arizona Maneuver Area. Its mission was to conduct broader large-scale training to toughen soldiers mentally and physically and to provide battle conditions for conducting firing training and testing and developing equipment, supplies, and training methods. The DTC/C-AMA saw its greatest level of activity in the summer and fall of 1943. In late 1943, personnel shortages (due to needs for personnel overseas) resulted in inefficient operation of the C-AMA, and General McNair recommended the facility be closed. The DTC/C-AMA was declared surplus in April 1944 by the War Department and was closed by the end of the month (Bischoff 2000).

Of specific interest in the vicinity of the Riverside East SEZ are Camp Coxcomb, Camp Desert Center, and Camp Young. Camp Coxcomb was located just northwest of the SEZ, between State Route 177 and the MWD aqueduct, and was constructed in the summer of 1942. Considered more permanent than some of the other camps, it had wooden floors and screens in the Post Exchange, along with 39 shower buildings, 165 latrines, 284 pyramidal wooden tent frames, a 400,000-gallon water tank, and a combination observation tower and flag tower. Several infiltration courses, machine gun, rifle and pistol ranges, and training areas have been found in the surrounding area associated with the camp. Camp Desert Center was located on the north side of I-10, between Chiriaco Summit and Desert Center west of the SEZ. It consisted of a maneuver area, an encampment with temporary housing, an evacuation hospital, an observers' camp, an ordinance campsite, and a quartermaster truck site. Camp Young was located just east of the SEZ, outside Blythe, and it was here General Patton lived during most of his stay. This camp maintained two station hospitals, several rifle and combat ranges to the south of the camp, 98 administration facilities, and 50 warehouses, along with bathhouses, mess halls and kitchens, Post Exchanges, hundreds of latrines, a post office, a radio station, a coliseum, pump stations, officer clubs, and various shops.

9.4.17.1.4 Traditional Cultural Properties—Landscape

The Tribes in this part of California tend to take a holistic view of the world; they see the features of their environment as an interconnected whole imbued with a life force. Prominent features may be seen as places of power—sacred places. High hills and mountains tend to be regarded as sacred, while some peaks have special status. Other features that tend to be regarded as sacred include caves, certain rock formations, springs, and hot springs. Revered locations include panels of rock art, evidence of ancestral settlements, arranged-rock sites, burial or cremation areas, and systems of trails. Sacred sites are often seen as places of power where offerings are left (Halmo 2003). Tribes see themselves as exercising divinely given responsibilities of stewardship over the lands where they believe they were created and as retaining a divine birthright to those lands. Specific mountain peaks are seen as points of emergence associated with creation stories. Although adopting much of the Mohave cosmology, the Tribes have retained their own identities. For example, the Chemehuevi have their own mountain of creation, Charleston Peak in Nevada (Halmo 2003), distinct from the Mohave's *Avikwaame* (Spirit Mountain) or Newberry Peak, also in Nevada. As mentioned above, there remains considerable interaction among the Tribes that inhabit the southeastern California deserts. A system of alliances furthered trade and the sharing of hunting and gathering grounds.

From the Native American perspective, the proposed Riverside East SEZ includes elements of a sacred landscape tied together by a network of trails. A Prehistoric Trails Network Cultural Landscape/Historic District has been proposed for trails near the SEZ (Tremaine and Kline 2010). A trail of importance to the Chemehuevi and other area Tribes is the Salt Song Trail, which runs generally north–south from north of Las Vegas to an area south of Blythe. It enters the SEZ via the Palen Valley and crosses the Chuckwalla Valley to the Colorado River, where it turns north to its point of origin (CSRI 1987). The *Xam Kwatcan* Trail, which is significant to the Quechan, also runs north–south. It follows the Colorado River from Pilot Knob (*Avikwalali*) near the Mexican border with Spirit Mountain (*Avikwaame*), connecting a series of ritually important places of power. It crosses Palo Verde Mesa (Johnson 2003) on its way north, either within or adjacent to the southern lobe of the proposed Riverside East SEZ. It continues northward along the terraces above the Colorado River to the Blythe Intaglios east of the Big Maria Mountains. In particular, the I-10 corridor follows a route with Native American roots. The Cocomaricopa Trail was a major east–west trade route that is intersected by the Salt Song and *Xam Kwatcan* Trails. It forms a culturally significant corridor and ties together culturally important features like Black Rock in the east with Alligator Rock in the Chuckwalla Valley to the west. Segments of this trail have been identified less than 2 mi (3 km) south of the western half of the SEZ. Other segments have been identified in the southern lobe of the SEZ (Eckhardt and Walker 2004). These trails did not consist of a single path, but were a network of intertwining paths most visible on the shoulders and tops of ridge systems, relatively stable alluvial fans, and other upland areas where footing was solid and there was less vegetation to deal with (Cleland and Apple 2003). In addition, the McCoy Springs District, the largest concentration of petroglyphs in the region, is associated with the network of trails. Located on the western slope of the McCoy Mountains, within 4 mi (5.5 km) of the SEZ, the district consists of more than 3,360 rock art panels and associated trail segments, archaeological deposits, and sleeping circles. It was not only a focus of prehistoric activity, but remains a culturally important site for Native Americans in the surrounding area (Bagwell and Kline 2010).

During consultations between the BLM and the Tribes regarding the construction of the Blythe, Genesis, and Palen fast-track solar facilities within the Riverside SEZ, Native Americans identified Alligator Rock, the Alligator Rock ACEC, the Palen Dry Lake shoreline, the Palen Dry Lake ACEC, the South Chuckwalla Mountains Petroglyph District, McCoy Springs, Black Rock, and the Mule Mountains ACEC as landscape features within 15 mi (24 km) of the proposed facilities that are of religious or cultural importance to the Tribes (BLM and CA SHPO 2010a–c).

Other mountains considered sacred include the Big Maria, Coxcomb, and Eagle Mountains (Halmo 2003). The Big Maria Mountains are adjacent to and northwest of the SEZ and form the western wall of McCoy Wash, and the Coxcomb Mountains lie between the Chuckwalla and Palen Valleys. Both valleys include parts of the SEZ. The Eagle Mountains are just west of the SEZ.

The proposed Riverside East SEZ appears to have been primarily used as a seasonal gathering area. The remains of temporary occupation sites have been found between the Chuckwalla Mountains and the Coxcomb Mountains. Some are associated with roasting pits, suggesting the area was a seasonal agave-harvesting area. This part of the valley has been identified as more likely to include resources important to Native Americans than the eastern end of the basin. Sites associated with rituals tend to be found on the basin floors, with more permanent campsites found in the foothills (CSRI 1987).

According to a Sacred Lands File Search through the NAHC, no sacred sites were identified within the Riverside East SEZ (Singleton 2010).

9.4.17.1.5 Cultural Surveys and Known Archaeological and Historic Resources

At least 109 previous surveys have been conducted in the vicinity of the proposed Riverside East SEZ, resulting in the recording of 574 total sites, at least 414 of which lie within the SEZ. The other 160 recorded sites are located within at least 5 mi (8 km) of the Riverside East SEZ. Of these sites, 53% are historic in nature, consisting mostly of artifacts related to the DTC/C-AMA, but some artifacts may be associated with mining, and more rarely homesteading/grazing that occurred in the area. The historic site types consist of refuse scatters, consisting mostly of metal cans, glass bottles and jars, broken ceramics, milled lumber, and sundry metal items; historic trails and roads, as well as tank tracks; historic camps consisting of cleared areas, probably for tent pads, and associated features such as hearths/campfires and refuse scatters, which may be associated with construction camps for the linear facilities or military or mining camps; historic cairns, often associated with mining claims; historic features such as survey markers, rock features, prospect pits, stone and wooden structures, fortified positions, aircraft parts, and smoke land mines. About 45% of the sites in the SEZ are prehistoric sites that consist of lithic scatters and quarries related to stone tool and ground stone tool production and maintenance, which make up the majority of prehistoric sites, and ceramic shards and pot drops, cairns, thermal features, and fragmentary bone and trail segments. The remaining 2% of sites are multi-component sites, consisting of both historic and prehistoric artifacts.

Most of the information about archaeological sites in and around the Riverside East SEZ was obtained from current solar energy applications, designated as “fast-track” projects, located within the Riverside East SEZ. The Palen Solar Power Project is located in the area around Palen Lake, in the western part of the Riverside East SEZ. The archaeological survey and research of previously recorded sites in the APE found 57 total sites recorded in the project area, 46 of which are within the Riverside East SEZ. Of these 57 sites, 43 are historic, and 14 sites are prehistoric (AECOM 2009a). The Blythe Solar Power Project is located in the eastern portion of the Riverside East SEZ. Through archaeological survey and determination of previously recorded sites that are located in the Blythe APE, 254 total sites were reported. Of the 254 sites, 204 are located in the Riverside East SEZ, the remaining 50 located within 5 mi (8 km) of the SEZ. There are 180 historic sites recorded, 68 prehistoric sites, and 6 multi-component sites that contain both prehistoric and historic artifacts and features (AECOM 2009b). The Genesis Solar Energy Project is located in the central portion of the Riverside East SEZ, just north of Ford Dry Lake. The archaeological survey and previously recorded sites indicated 98 sites present in the Genesis APE, 36 of which are also within the Riverside East SEZ, the other 62 sites being located within 5 mi (8 km) of the SEZ (Tetra Tech 2009). Of the 98 sites, 77 are prehistoric in nature, 15 are historic, 4 are multi-component, and 2 are undetermined. The Desert Sunlight Solar Farm Project is located in the western portion of the proposed Riverside East SEZ, about 6 mi (10 km) north of Desert Center. The archaeological survey and previously recorded sites identified 87 sites in the Desert Solar APE, all of which also are present in the proposed Riverside East SEZ. Of these 87 sites, 75 are historic, 5 are prehistoric, 1 is a multicomponent site, and 2 are undetermined (BLM 2010g).

In addition to the solar energy fast-track projects, the Devers-Palo Verde II 500-kV transmission line survey also served as a valuable source of information regarding archaeological sites. This transmission line survey is located south and west of the Riverside East SEZ until it intersects the southeastern portion of the SEZ (as it crosses I-10 near the Wiley Well Rest Area to the area just west of the Palo Verde Mesa). This survey identified 78 archaeological sites—41 sites in the Riverside East SEZ, and 37 sites within 5 mi (8 km) of the SEZ. Fifty-nine of these sites are prehistoric in nature, and the other 19 are historic (Carrico et al. 2005).

There are two dry lakebeds located in the area of the SEZ, Ford Dry Lake and Palen Dry Lake, portions of which lie in the SEZ. During present times these lakes only hold water during occasional flooding, but it is likely that during the Late Pleistocene and Early Holocene these pluvial lakes were filled with water, providing a lacustrine environment upon which archaic peoples were able to subsist. Lake Cahuilla was located west of the SEZ, and was assuredly filled with water at times due to flooding episodes of the Colorado River and Early Pleistocene pluvial actions; a plethora of sites have been documented along the shores of Ancient Lake Cahuilla, dating from the Early Archaic to the Late Prehistoric period. Therefore, it is not unreasonable to assume that Palen Dry Lake and Ford Dry Lake provided similar potential for habitation and subsistence. Also associated with Lake Cahuilla is Obsidian Butte, a large source of obsidian that became available for ancient peoples to exploit during receding periods of the lake; this obsidian provided a valuable source of raw material for tool production.

In addition to Eagle Mountain Mine, located in the Eagle Mountains, mining activities took place in the McCoy Mountains, the Little and Big Maria Mountains, and the Mule

Mountains. Other than Eagle Mountain Mine, most of these mines operated for only short periods of time. In addition to these more established mines, there are some smaller prospecting pits in the surrounding mountains.

There are several areas near the SEZ related to DTC/C-AMA activities, in addition to the nearby camps mentioned in Section 9.4.17.1.3. One of these locations is the Desert Center Army Airfield, consisting of two paved runways, taxi-ways, a parking apron, and 40 constructed buildings that were demolished after DTC/C-AMA use. There is another location in the Midland-Big Maria Mountain area, site CA-RIV-1172, that consists of rock features probably related to defensive positions, rock walls, foxholes, dugouts, and cairns. This training area has been recommended as NHRP eligible. North of the SEZ at Palen Pass, is the site of the largest maneuver area in the DTC/C-AMA. This site consists of fortifications constructed throughout the pass, gun emplacements, barbed wire entanglements, bunkers, minefields, and foxholes. The best-preserved maneuver area, consisting of foxholes, associated refuse, concertina wire, concrete defensive positions and tank tracks, is in the valley bordered by the Palen, Little Maria, and McCoy Mountains, just outside the SEZ. A large minefield between the mountains and the sand dunes to the east of the Coxcomb Mountains may be located within the SEZ. In addition, small unit training exercises were held in the Chuckwalla Valley, as well as in the Midland and Styxx Passes.

The BLM has designated several locations relatively close to the proposed Riverside East SEZ as ACECs because of their significant cultural value. The ACECs contiguous with the SEZ on the south are the Mule Mountains ACEC on the eastern end of the SEZ and the Alligator Rock ACEC on the western end. The proposed SEZ surrounds the Palen Dry Lake ACEC on three sides. Two other ACECs are located just 5 mi (8 km) from the proposed SEZ. These are the Corn Springs ACEC to the south, which includes both historic and prehistoric resources, and the Big Marias ACEC to the east. The latter includes a concentration of Native American cultural resources including the Blythe Intaglios, prehistoric trails, and other archaeological sites. Approximately 12 mi (19 km) to the north is the Patton's Iron Mountain Divisional Camp ACEC, a site representing the importance of military history in the region (BLM 1999; 2008).

National Register of Historic Places

There are no historic properties listed in the NRHP within the SEZ; however, there are at least six NRHP-listed sites located within 5 mi (8 km) of the SEZ: McCoy Spring Archaeological Site, Corn Springs, the Gus Lederer Site, the North Chuckwalla Mountains Petroglyph District, the North Chuckwalla Quarry District, and the Blythe Intaglios. Other sites listed in the NRHP within the vicinity of the Riverside SEZ include archaeological sites CA-RIV-504 and CA-RIV-773.

Camp Coxcomb, mentioned in Section 9.4.17.1.3 and CA-RIV-1172, are two DTC/C-AMA–associated sites that have high integrity and substantial remains, suggesting that they are eligible for listing in the NRHP. Several of the other camps and maneuver areas may be eligible for NRHP inclusion; however, more research needs to be conducted to determine their eligibility. Also considered potentially eligible is the Contractor's General Hospital, located north of Desert

Center near the Eagle Mountains. This was a hospital created by Dr. Sidney Garfield in service to the workers on the CRA. Other potentially eligible sites in the vicinity of the SEZ include Wiley's Well Road, an offshoot of the Bradshaw Trail used between 1862 and 1877, the Blythe-Eagle Mountain 161-kV Transmission Line built in 1855, and the Blythe Intake Landmark 948.

9.4.17.2 Impacts

Direct impacts on significant cultural resources could occur in the proposed Riverside East SEZ; however, as stated in Section 9.4.17.1, further investigation is needed in a number of areas. A cultural resource survey of the entire APE of a proposed project would first need to be conducted to identify archaeological sites, historic structures and features, and traditional cultural properties, and an evaluation would need to follow to determine whether any are eligible for listing in the NRHP. The Riverside East area was regularly traversed in prehistoric and ethnohistoric times with trail networks ultimately connecting the Colorado River with Lake Cahuilla and the Pacific Coast. Archaeological sites and traditional cultural properties are likely abundant along these networks, and the trails themselves are considered important properties. Activities associated with the WWII DTC were also prominent in the valley and physical remnants of those activities are present within the SEZ. Possible impacts from solar energy development on cultural resources that are encountered within the Riverside East SEZ or along related ROWs, as well as general mitigation measures, are described in more detail in Section 5.15. Impacts would be minimized through the implementation of required programmatic design features described in Appendix A, Section A.2.2. Programmatic design features assume that the necessary surveys, evaluations, and consultations will occur.

Programmatic design features to reduce water runoff and sedimentation would reduce the likelihood of indirect impacts on cultural resources resulting from erosion outside of the SEZ boundary (including along ROWs). Indirect impacts on cultural resources through vandalism or theft are possible, given the large size of the SEZ and its accessibility, as well as its proximity to several NRHP-listed historic properties, eligible archaeological sites, areas of significance to Tribes and historic resources associated with the DTC/C-AMA.

No new access roads or transmission lines have been assessed for the proposed Riverside East SEZ, assuming existing corridors would be used; impacts on cultural resources related to the creation of new corridors would be evaluated at the project-specific level if new road or transmission construction or line upgrades are to occur.

Because of the interconnectedness of the landscape in Native American cosmology, a change in one part affects the whole, thus damage to one part of the sacred landscape would affect the entire network. The proposed Riverside East SEZ includes the southern end of the Salt Song Trail and a section of the northern branch of the Cocomaricopa Trail. Since visible segments tend to follow the shoulders and tops of ridge systems, it is likely that they will not be directly impacted by the development of solar facilities. However, Native Americans have expressed concern over the visual impacts of development on segments of those trails that have religious importance (Halmo 2003). Development that is visible from the trails may be considered intrusive. The proposed Riverside East SEZ is not pristine wilderness. It is crossed and bordered by a major interstate highway, and is scarred by tank tracks dating from WWII. However, the construction of an extensive solar energy facility would very likely have more visual impact on the landscape than already exists.

Native Americans have also expressed concern over other impacts likely to accompany development (Halmo 2003). The presence of an industrial facility and the associated increase in traffic and workers are likely to have a negative impact on the qualities that render a site sacred. An increase in the number of people in the area would increase the potential for damage to panels of rock art and the disturbance of burials and archaeological sites. While the development of the Riverside East SEZ would necessarily increase the number of people coming to and working in the SEZ, this impact should be greatest during the construction and decommissioning phases of a facility. The operation of a solar facility would require fewer personnel (see Section 9.4.19.2.2).

9.4.17.3 SEZ-Specific Design Features and Design Feature Effectiveness

Programmatic design features to mitigate adverse impacts on significant cultural resources, such as avoidance of significant sites and features, cultural awareness training for the workforce, and measures for addressing possible looting/vandalism issues through formalized agreement documents, are provided in Appendix A, Section A.2.2.

SEZ-specific design features would be determined in consultation with the California SHPO and affected Tribes. Consultation efforts should include discussions on significant archaeological sites and traditional cultural properties and on sacred sites and trails, such as the Salt Song Trail, within or with views of the proposed SEZ. SEZ-specific design features could include the following:

- Significant resources clustered in specific areas, such as those in the vicinity of Palen and Ford Dry Lakes, focused DTC/C-AMA activity areas that retain sufficient integrity, and Native American trails evident in the desert pavement should be avoided.

- Troops in training for WWII often used the same locations that Native Americans did for similar purposes (CSRI 1987). Any excavation of historic sites should take into consideration the potential for the co-location of prehistoric and ethnohistoric components.

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9.4.18 Native American Concerns

As discussed in Section 9.4.17, many Native Americans tend to view their environment holistically and share many environmental and socioeconomic concerns with other ethnic groups. For a discussion of issues of possible Native American concern shared with the population as a whole, several sections in this PEIS should be consulted. General topics of concern are addressed in Section 4.16. Specifically for the proposed Riverside East SEZ, Section 9.4.17 discusses archaeological sites, structures, landscapes, trails, and traditional cultural properties; Section 9.4.8 discusses mineral resources; Section 9.4.9.1.3 discusses water rights and water use; Section 9.4.10 discusses plant species; Section 9.4.11 discusses wildlife species, including wildlife migration patterns; Section 9.4.13 discusses air quality; Section 9.4.14 discusses visual resources; Sections 9.4.19 and 9.4.20 discuss socioeconomics and environmental justice, respectively; and issues of human health and safety are discussed in Section 5.21. This section focuses on concerns that are specific to Native Americans and to which Native Americans bring a distinct perspective.

The NAHC has been consulted to determine which Tribes have a traditional association with the California SEZs (Singleton 2010). All federally recognized Tribes with traditional ties to the proposed Riverside East SEZ have been contacted so that they could identify their concerns regarding solar energy development. Because Tribal land claims are overlapping and because conflicts among the Tribes and with Euro-Americans resulted in the dispersal of many of the original land occupants, contacts have been initiated over a wide area with Tribes that could include descendants of the indigenous inhabitants of the area. Table 9.4.18-1 lists the Tribes contacted with traditional ties to the SEZs in southeastern California. Appendix K lists all federally recognized Tribes contacted for this PEIS.

The concerns of Native Americans, including the Serrano, Cahuilla, Quechan, Mohave and Chemehuevi, over other energy development projects in the region also have been documented and are summarized in the next section. These comments provide important insights into their concerns over energy development in the area.

9.4.18.1 Affected Environment

As discussed in Section 9.4.17.1.2, the territorial boundaries of the Tribes who inhabited the Colorado Desert appear to have been fluid over time. At times they overlapped, and resources were shared where abundant. The Riverside East SEZ may well have been an intermittent joint use area (Knack 1981), lying between the home ranges of the Tribes in the region, but occasionally used by all. The Tribal Traditional Use Area boundaries considered here are those presented by the Tribes themselves to the Indian Claims Commission in the 1950s. While the commission recognized the individual claims for the Chemehuevi, Mohave, and Quechan, most of California, including much of the southeastern part of the state, was judged to be the common territory of the "Indians of California" and is so shown on maps of judicially established Native American land claims (Royster 2008). This category was created by Congress to accommodate the claims of California Native Americans who had lost their identities as

TABLE 9.4.18-1 Federally Recognized Tribes with Traditional Ties to the Southeastern California SEZs

Tribe	Location	State
Agua Caliente Band of Cahuilla Indians	Palm Springs	California
Cabazon Band of Cahuilla Mission Indians	Indio	California
Cahuilla Band of Mission Indians	Anza	California
Campo Kumeyaay Nation	Campo	California
Chemehuevi Indian Tribe	Havasu Lake	California
Colorado River Indian Tribes	Parker	Arizona
Ewiiaapaayp Band of Kumeyaay Indians	Alpine	California
Fort Mojave Indian Tribe	Needles	California
La Posta Band of Kumeyaay Indians	Boulevard	California
Los Coyotes Band of Cahuilla & Cupeno Indians	Warm Springs	California
Manzanita Band of Kumeyaay Indians	Boulevard	California
Morongo Band of Mission Indians	Banning	California
Quechan Indian Tribe of the Fort Yuma Reservation	Yuma	Arizona
Salt River Pima-Maricopa Indian Community	Scottsdale	Arizona
San Manuel Band of Mission Indians	Patton	California
Soboba Band of Luiseño Indians	San Jacinto	California
Sycuan Band of the Kumeyaay Nation	El Cajon	California
Torres-Martinez Desert Cahuilla Indians	Thermal	California
Twentynine Palms Band of Mission Indians	Coachella	California
Viejas Band of Kumeyaay Indians	Alpine	California

distinct tribes, bands, or villages due to the arrival and policies of Euro-Americans (Indian Claims Commission 1958). The claims of the Serrano and Cahuilla, and much of the land claimed by the Mohave and Quechan, lie within the Indians of California territory, but were also presented individually to the commission. In their claims, Tribes appear to have often taken into consideration the claims made by neighboring Tribes. The Mohave submitted two claims. One claim, accepted by the commission, was restricted to areas along the Colorado River, the other, reflecting their view that they were the original inhabitants of southeastern California and all others latecomers, includes much of Chemehuevi and Indians of California territory also claimed by the Serrano and the Cahuilla (Indian Claims Commission 1958; CSRI 2002). The next section presents territorial claims relevant to the Riverside East SEZ.

9.4.18.1.1 Territorial Boundaries

Serrano

Although the primary traditional homeland of the Serrano appears to have been the San Bernardino Mountains west of the SEZ, the Serrano claim includes most of the Riverside East SEZ north of I-10. Their claim extends from Cadiz, California, southeast to a point in the Big Marias 12 mi (19 km) west of the Colorado River, then parallels the Colorado River southward to a point 12 mi (19 km) due west of Blythe and extends westward to Hayfield Reservoir on the CRA. The Halchidhoma Trail appears to have formed the southern boundary of their claim in this part of the desert (CSRI 2002). Serrano descendants live primarily on the Morongo and San Manuel Reservations, where they have mixed with the Cahuilla.

Cahuilla

The Coachella Valley, southwest of the Riverside East SEZ, lies at the heart of Cahuilla territory, southwest of the Riverside East SEZ. However, the northern boundary of their claim matches the southern boundary of the Serrano. It extends eastward to a point 12 mi (19 km) west of Blythe then southward paralleling the Colorado River to a point 3 mi (5 km) south of the Riverside County line. It thus includes much of the southern portion of Chuckwalla Valley and the southeastern lobe of the SEZ (CRSI 2002). Cahuilla descendants may be found on several small reservations in Southern California.

Quechan

While the heart of Quechan territory lies at the confluence of the Gila and Colorado Rivers, well to the south of the SEZ, they have in the past occupied the banks of the Colorado River as far north as Blythe. Their territorial claim includes the eastern half of the SEZ. As presented to the Indian Claims Commission, their eastern boundary extended along the crest of the mountains east of the Colorado River as far north as Blythe, where it jogs westward to the channel of the Colorado River, following the channel northward to a point just north of the Riverside Mountains. It thus includes much of the *Xam Kwatcan* Trail. From the Riverside Mountains it extends southwest to the Little Maria Mountains, then south to the McCoy Mountains and southwest to the Chuckwalla Mountains (Indian Claims Commission 1958). The claim overlaps with those of the Cahuilla, Serrano, and Mohave. Quechan descendants occupy the Fort Yuma Indian Reservation in Arizona and California.

Mohave

The territory claimed by the Mohave lies primarily to the east of the SEZ. They claimed lands on both banks of the Colorado River to the crests of the mountains as far south as Blythe and inland north of a line extending from the Whipple Mountains to the Turtle, the Granite Mountains, the Eagle Mountains, and the San Bernardino Mountains, thus skirting the basins where the SEZ is located (CSRI 2002). Mohave descendants occupy the Fort Mojave Indian Reservation near Needles, California, and may be found on the reservation of the Colorado River Indian Tribes.

Chemehuevi

The Chemhuevi were northern neighbors. Their territorial claims extend only as far south as the Granite Mountains and the Little and Big Maria Mountains. As neighbors they are likely to have traversed this joint-use zone as well (CSRI 2002). Chemehuevi descendants occupy the Chemehuevi Reservation and share the Colorado River Indian Tribes Reservation with the Mohave and other Tribes.

Halchidhoma

The Halchidhoma were forced off their lands along the Colorado River by neighboring Tribes in about 1827, before the United States acquired the area from Mexico. They probably occupied territory around Blythe similar in extent to that claimed by the Mohave in that area. Their descendants have been integrated into the Maricopa Tribe and may be found on the Salt River Pima-Maricopa Indian Reservation in Arizona (Harwell and Kelly 1983).

9.4.18.1.2 Plant Resources

Native Americans tend to view the whole of the landscape as imbued with a lifeforce, including features and objects viewed by Euro-American cultures as inanimate. The importance of landscapes, geophysical features, trails, rock art, and archaeological sites is discussed in Section 9.4.17. To the extent that they are religiously significant, it is important to the Tribes that they retain access to such features located on federal land as required by AIRFA. This section focuses on other Native American concerns, including those that have ecological as well as cultural components. For many Native Americans, the taking of game or the gathering of plants or other natural resources may have been seen as both a sacred and secular act (Stoffle et al. 1990).

The traditional Native American subsistence base in the Colorado Desert was a mixture of floodplain agriculture and hunting and gathering. The proportion of farming to gathering varied with the Tribe and the land they occupied. The Riverside East SEZ does not lie within the heartland of any Tribe and is likely to have been used for hunting and gathering, as the campsites and agave roasting pits found throughout Chuckwalla Valley attest. Traditionally, Native American Tribes in the Colorado Desert practiced a seasonal round in harvesting naturally occurring plant resources. For example, agave heads are harvested in early spring, mesquite produced a summer crop, and fall might include harvests of pine nuts or acorns at higher elevations (Lightfoot and Parish 2009). Proximity to valuable plant resources and water were important factors in determining where Native Americans chose to build their villages and camps. Native Americans commenting on nearby development projects have voiced concern over the loss of culturally important plants used for food, medicine, and ritual purposes and for making tools, implements, and structures. The plant communities observed or likely to be present at the Riverside East SEZ are discussed in Section 9.4.10. Most of the valley bottoms support a combination of Sonora-Mojave Creosotebush-White Bursage Desert Scrub, and North American Warm Desert Wash plant communities. There are some areas of North American Warm Desert

Pavement near Palen Dry Lake, while Ford Dry Lake is classified as North American Warm Desert Playa. There are a few areas of North American Warm Desert Active and Stabilized Dune (NatureServe 2008). While these communities appear sparse most of the year, seasonal rains often result in an explosion of ephemeral herbaceous species. Native Americans commenting on the area for a previous project found that vegetation more luxuriant on the western end of the Chuckwalla Basin and more likely to attract game (CSRI 1987).

Native American populations have traditionally made use of hundreds of native plants. Table 9.4.18.1-1 lists plants often mentioned as important by Native Americans that were either observed at the Riverside East SEZ or are possible members of the cover-type plant communities

TABLE 9.4.18.1-1 Plant Species Important to Native Americans Observed or Likely To Be Present in the Proposed Riverside East SEZ

Common Name	Scientific Name	Status
Food		
Beavertail prickly pear cactus	*Opuntia basilaris*	Possible
Buckwheat	*Eriogonum* spp.	Possible
Cat claw	*Acacia greggii*	Possible
Cholla cactus	*Cylindropuntia* spp.	Observed
Desert almond	*Prunus fasciculatum*	Possible
Honey mesquite	*Prosopis glandolosa*	Observed
Palo Verde	*Cercidium floridum*	Observed
Saltbush	*Atriplex* spp.	Possible
Smoke tree/indigo bush	*Psorothamnus spinosus*	Observed
Sumac	*Rhus* spp.	Possible
Medicine		
Creosotebush	*Larrea tridentata*	Observed
Greasewood	*Sacarbatus vermiculatus*	Possible
Mormon tea	*Ephedra nevadensis*	Possible
Sagebrush	*Artemisia* spp.	Possible
Ritual		
Ironwood	*Olneya tesota*	Observed
Raw Material		
Desert-willow	*Chilopsis linaeris*	Observed
Unspecified		
Boxthorn	*Lycium* sp.	Possible
Brittlebush	*Opuntia* sp.	Observed
Burrowbush	*Ambrosia dumosa*	Observed
Cheesebush	*Hymenoclea salsola*	Observed
Ocotillo	*Fouquieria splendnens*	Possible

Sources: Field visit; Lightfoot and Parish (2009); and NatureServe (2008).

identified in the SEZ. The plants are grouped by use category, but a plant is not necessarily confined to one use. These plants are the dominant species; however, other plants important to Native Americans could occur in the SEZ, depending on localized conditions and the season. Overall, creosotebush dominates the SEZ, while ironwood and mesquite occur in the washes. Mesquite was among the most important food plants. Its long, bean-like pods were harvested in the summer, could be stored, and were widely traded. Groves were managed by burning. Its blossoms are edible, and the cicadas and grasshoppers that live in the groves were collected and eaten by the Cahuilla. Mesquite trunks served as a source of wood, fiber from its inner bark was made into string, its thorns were used for tattooing, and its gum was used as an adhesive, a cleansing agent, and medicine. Saltbush and buckwheat seeds were harvested, processed, and eaten (Lightfoot and Parish 2009).

The proposed Riverside East SEZ includes other plants useful to Native Americans. The leaves of the dominant creosotebush were widely made into tea for medicinal purposes. The trunks of greasewood were used in construction, while its leaves and branches were used in curing, as was a tea made from *Ephedra viridis*, or Mormon tea. Desert-willow was used in house construction and for making bows (Lightfoot and Parish 2009), while ironwood was considered sacred by the Cahuilla (Bean et al. 1978).

9.4.18.1.3 Other Resources

The proposed Riverside East SEZ may also have been a hunting ground. The mountains surrounding the SEZ provide habitat for the reclusive burro deer, a desert-adapted variety of mule deer, and desert bighorn sheep. Traditionally, deer have been an important source of both food and materials, such as bone, sinew, and hide, used to make a variety of implements. Scat and tracks of both burrow deer and bighorn sheep have been observed seasonally within the SEZ (Chaney-Davis et al. 2010). While big game was highly prized, smaller animals such as black-tailed jackrabbits and desert cottontail, both present in the SEZ, traditionally provided a larger proportion of the protein in Native American diets and were an important source for making blankets and clothing (Lightfoot and Parrish 2009). Animals traditionally hunted by Native Americans are listed in Table 9.4.18.1-2.

Mineral resources important to Native Americans in the Colorado Desert include clay suitable for making pottery, stone suitable for the manufacture of both cutting and grinding tools, hematite for pigment, and quartz crystals considered to have healing properties (Halmo 2003). The dry lakebeds may have served as a source of clay, while quartz crystals have been recorded during cultural resource surveys in the area (Eckhardt and Wilson 2009).

As long-time desert dwellers, Native Americans have a great appreciation for the importance of water in a desert environment. They have expressed concern over the use and availability of water for solar energy installations (Halmo 2003; Jackson 2009). One of the main concerns over past industrial projects planned for the region was the contamination of ground water, which they see as ultimately flowing to the Colorado River and affecting the basin as a whole (CSRI 1987).

TABLE 9.4.18.1-2 Animal Species Used by Native Americans Whose Range Includes the Proposed Riverside East SEZ

Common Name	Scientific Name	Status
Mammals		
Badger	*Taxidea taxus*	All year
Bighorn sheep	*Ovis canadensis*	All year
Black-tailed jackrabbit	*Lepus californicus*	All year
Bobcat	*Lynx rufus*	All year
Coyote	*Canis latrans*	All year
Desert cottontail	*Silvilagus audubonii*	All year
Mule deer	*Odocoileus hemionus*	Seasonally
Squirrel	*Spermophilus* sp. and *Ammospermophilus* sp.	All year
Wood rat	*Neotoma* spp.	All year
Birds		
Gambel's quail	*Callipepla gambelii*	All year
Doves		
White-winged dove	*Zenaida asiatica*	Summer
Mourning dove	*Zenaida macrocura*	All year
Reptiles		
Desert tortoise	*Gopherus agassizii*	All year
Rattlesnake	*Crotalus* spp.	All year

Sources: Lightfoot and Parrish (2009); Fowler (1986); Stewart (1983).

Some Tribes share with the populace as a whole concerns over potential danger from electromagnetic fields. In traditional Cahuilla culture, electricity, both natural (lightning) and artificially generated, is considered dangerous and something to be avoided (Bean et al. 1978). They may have concerns over a facility that produces electricity and its associated transmission system.

In addition, Native Americans have expressed concern over ecological segmentation, that is, development that fragments animal habitat and does not provide corridors for movement. They would prefer solar energy development take place on land that has already been disturbed, such as abandoned farmland, rather than on undisturbed ground (Jackson 2009).

9.4.18.2 Impacts

To date, no comments have been received from the Tribes specifically referencing the proposed Riverside East SEZ. However, the Soboba Band of Luiseño Indians, based on their traditional ties to the Cahuilla, find some of the California SEZs to be within their Tribal Traditional Use Area and consider part of the area to be highly sensitive (Ontiveros 2010). The Agua Caliente Band of Cahuilla Indians, commenting on the fast-track solar facilities proposed for within the SEZ, considers much of the proposed Riverside East SEZ to be within their

Traditional Use Area. They are concerned about adverse effects on historical resources including traditional cultural places, sacred places, gathering places, trails, and their associated cultural landscapes (Garcia-Tuck 2010). In a response letter, the Quechan Indian Tribe of Fort Yuma indicates that some of the SEZs lie within their Tribal Traditional Use Area. They stress the importance of evaluating impacts on landscapes as a whole. Because trails have both physical and spiritual components, from their perspective the intrusion of industrial development nearby would have negative effects on trails (Jackson 2009).

In the past, the Chemehuevi have expressed concerns over the Salt Song Trail, which passes down Palen Valley and through the SEZ (Ridder 1998; Halmo 2003), as has the NALC, an inter-tribal organization (Russo 2009). Even if solar energy development within the western portions of the SEZ avoids the trail, facilities would be visible from the trail and would present a visual intrusion.

The impacts that would be expected from solar energy development within the proposed Riverside East SEZ on resources important to Native Americans fall into two major categories: impacts on the landscape and impacts on discrete localized resources.

Potential landscape-scale impacts are those caused by the presence of an industrial facility within a sacred landscape that includes sacred mountains and other geophysical features tied together by a network of culturally important trails. Impacts may be visual—the intrusion of an industrial feature in sacred space; audible—noise from the construction, operation, or decommissioning of a facility detracting from the traditional cultural values of the site; or demographic—the presence of a larger number of outsiders in the area that would increase the chance that the sacredness of the area would be degraded by more foot and motorized traffic. As consultation with the Tribes continues and project-specific analyses are undertaken, it is possible that Native Americans will express concerns over potential visual and noise effects of solar energy development within the SEZ on the landscape, such as on the Big Maria, Coxcomb, and Eagle Mountains, physical features such as Alligator Rock and Black Rock, on the Salt Song Trail, and on shrines and sacred places (see also Section 9.4.17).

Localized effects could occur both within the SEZ and in adjacent areas. Within the SEZ these effects would include destroying or degrading important plant resources, destroying the habitat of and impeding the movement of culturally important animal species, destroying archaeological sites and burials, and degrading or destroying trails and sacred places. Known resources of this type are scattered throughout the SEZ. Any ground-disturbing activity associated with the development within the SEZ has the potential for destruction of localized resources. Since solar energy facilities cover large tracts of ground, even taking into account the implementation of programmatic design features, it is unlikely that avoidance of all resources would be possible. Programmatic design features (see Appendix A, Section A.2.2) assume that the necessary cultural surveys, site evaluations, and Tribal consultations will occur.

Implementation of programmatic design features, as discussed in Appendix A, Section A.2.2, should eliminate impacts on Tribes' reserved water rights and the potential for groundwater contamination issues.

Whether there are any issues relative to socioeconomics, environmental justice, or health and safety relative to Native American populations is yet to be determined.

9.4.18.3 SEZ-Specific Design Features and Design Feature Effectiveness

Programmatic design features to mitigate impacts of potential concern to Native Americans, such as avoidance of sacred sites, water sources, and tribally important plant and animal species, are provided in Appendix A, Section A.2.2.

The development of solar energy facilities in the state of California requires developers to follow CEC guidelines for interacting with Native American in addition to federal requirements (CEC 2009c). Developers must obtain information from California's NAHC on the presence of Native American sacred sites in the project vicinity and a list of Native Americans who want to be contacted about proposed projects in the region. Table 9.4.18.3-1 lists the tribes recommended for contact by the NAHC.

The need for and nature of SEZ-specific design features regarding potential issues of concern would be determined during government-to-government consultation with affected Tribes.

The Agua Caliente consider the cumulative effects of the development of solar energy facilities in and around the SEZ on Tribally important resources to be "immeasurable and unmitigable" and wishes to be involved in the process of determining project significance (Garcia-Tuck 2010).

TABLE 9.4.18.3-1 Federally Recognized Tribes Listed by the NAHC to Contact Regarding the Riverside East SEZ

Tribe	Location	State
Agua Caliente Band of Cahuilla Indians	Palm Springs	California
Chemehuevi Indian Tribe	Havasu Lake	California
Colorado River Indian Tribes	Parker	Arizona
Cocopah Indian Tribe	Somerton	Arizona
Fort Mojave Indian Tribe	Needles	California
Morongo Band of Mission Indians	Banning	California
Quechan Indian Tribe of the Fort Yuma Reservation	Yuma	Arizona
San Manuel Band of Mission Indians	Patton	California
Torres-Martinez Desert Cahuilla Indians	Thermal	California
Twentynine Palms Band of Mission Indians	Coachella	California

Source: Singleton (2010).

The Quechan Tribe and the Soboba Band of Luiseño Indians have requested that they be consulted at the inception of any solar energy project that would affect resources important to them. The Quechan also suggest that the clustering of large solar energy facilities be avoided, that priority for development be given to lands that have already been disturbed by agricultural or military use, and that the feasibility of placing solar collectors on existing structures be considered, thus minimizing or avoiding the use of undisturbed land (Jackson 2009).

The BLM has actively sought the participation of the Tribes of southeastern California in identifying cultural resources important to Native Americans that would be adversely affected by the construction and operation of three fast-track solar facilities that lie within the SEZ. Tribes have participated in the development of programmatic agreements for each of the proposed Blythe, Genesis, and Palen facilities (see Table 9.4.18.3-2). Under the terms of these agreements, the Tribes are afforded the opportunity to review and comment on BLM's findings of effect on cultural resources important to the Tribes and participate in the development of Historic Properties Treatment Plans, Historic Properties Management Plans, and monitoring and discovery plans in order to ensure the resolution of identified adverse effects on cultural properties important to the Tribes through avoidance, minimization, or mitigation. These plans will include provisions for Tribal cultural specialists to monitor the construction and operation of the facilities for adverse effects on cultural properties (BLM and CA SHPO 2010a–c).

Mitigation of impacts on archaeological sites and traditional cultural properties is discussed in Section 9.4.17.3, in addition to programmatic design features for historic properties discussed in Appendix A, Section A.2.2.

TABLE 9.4.18.3-2 Federally Recognized Tribes Invited to Concur on Programmatic Agreements for the Fast-Track Solar Energy Projects within the Proposed Riverside East SEZ

Tribe	Blythe	Genesis	Palen
Agua Caliente Band of Cahuilla Indians	×	×	×
Augustine Band of Mission Indians	×	×	×
Cabazon Band of Mission Indians	×	×	-
Chemehuevi Indian Tribe	×	×	×
Cocopah Indian Tribe	×	×	-
Colorado River Indian Tribes	×	×	×
Fort Mojave Indian Tribe	×	×	×
Morongo Band of Mission Indians	×	×	×
Quechan Indian Tribe of the Fort Yuma Reservation	×	×	×
Ramona Band of Mission Indians	-	×	×
San Manuel Band of Mission Indians	×	×	×
Soboba Band of Luiseño Indians	-	×	-
Torres-Martinez Desert Cahuilla Indians	×	×	×
Twentynine Palms Band of Mission Indians	×	×	×

Source: BLM and California SHPO (2010a–c).

9.4.19 Socioeconomics

9.4.19.1 Affected Environment

This section describes current socioeconomic conditions and local community services within the ROI surrounding the proposed Riverside East SEZ. The ROI is a one-county area consisting of Riverside County in California. It encompasses the area in which workers are expected to spend most of their salaries and in which a portion of site purchases and nonpayroll expenditures from the construction, operation, and decommissioning phases of the proposed SEZ facility are expected to take place.

9.4.19.1.1 ROI Employment

In 2008, employment in the ROI stood at 839,878 (Table 9.4.19.1-1). Over the period 1999 to 2008, the annual average employment growth rate in Riverside County was 2.5%, slightly higher than the average rate for California (0.9%).

In 2006, the service sector provided the highest percentage of employment in the ROI at 44.3%, followed by wholesale and retail trade with 20.4 % (Table 9.4.19.1-2). Smaller employment shares were held by construction (13.8%) and manufacturing (9.9%).

9.4.19.1.2 ROI Unemployment

Over the period 1999 to 2008, the average rate in Riverside County was 6.0%, slightly higher than the average rate for California (5.8%) (Table 9.4.19.1-3). The unemployment rate for the first 10 months of 2009 (13.8%), contrasts with the rate for 2008 as a whole (8.6%). The average rate for California as a whole (11.6%) was also higher during this period than the corresponding average rates for 2008.

TABLE 9.4.19.1-1 ROI Employment in the Proposed Riverside East SEZ

Location	1999	2008	Average Annual Growth Rate, 1999–2008 (%)
Riverside County	653,552	839,878	2.5
California	15,566,900	17,059,574	0.9

Sources: U.S Department of Labor (2009a,b).

TABLE 9.4.19.1-2 ROI Employment in the Proposed Riverside East SEZ, by Sector, 2006[a]

Industry	Riverside County	% of Total
Agriculture[a]	17,064	3.0
Mining	505	0.1
Construction	78,556	13.8
Manufacturing	56,582	9.9
Transportation and public utilities	21,835	3.8
Wholesale and retail trade	116,343	20.4
Finance, insurance, and real estate	26,964	4.7
Services	252,847	44.3
Other	89	0.0
Total	570,468	

[a] Agricultural employment includes 2007 data for hired farmworkers.

Sources: U.S. Bureau of the Census (2009a); USDA (2009).

TABLE 9.4.19.1-3 ROI Unemployment Rates (%) for the Proposed Riverside East SEZ

Location	1999–2008	2008	2009[a]
Riverside County	6.0%	8.6%	13.8%
California	5.8%	7.2%	11.6%

[a] Rates for 2009 are the average for January through May.

Sources: U.S. Department of Labor (2009a–c).

9.4.19.1.3 ROI Urban Population

The population of Riverside County in 2006 to 2008 was 68% urban, with the majority of urban areas located in the western portion of the county. The largest urban area, Riverside, had an estimated 2008 population of 293,207; other large cities in the western portion of the county in include Moreno Valley (188,676) and Corona (148,336) (Table 9.4.19.1-4). In addition, there are eight cities in the county with a 2008 population between 50,000 and 99,999 persons. The

TABLE 9.4.19.1-4 ROI Urban Population and Income for the Proposed Riverside East SEZ

	Population			Median Household Income ($ 2008)		
City	2000	2008	Average Annual Growth Rate, 2000–2008 (%)	1999	2006–2008	Average Annual Growth Rate, 1999 and 2006–2008 (%)[a]
Riverside	255,166	293,207	1.8	53,620	56,805	0.6
Moreno Valley	142,381	188,676	3.6	61,101	55,178	–1.1
Corona	124,966	148,336	2.2	76,755	78,120	0.2
Murietta	44,282	97,935	10.4	78,424	79,135	0.1
Temecula	57,716	95,853	6.5	76,628	77,394	0.1
Indio	49,116	83,475	6.9	44,579	53,824	2.1
Hemet	58,812	70,821	2.3	34,556	34,974	0.1
Perris	36,189	55,150	5.4	45,774	53,442	1.7
Cathedral City	42,647	51,790	2.5	50,068	42,026	–1.9
Palm Desert	41,155	50,490	2.6	62,208	55,218	–1.3
Lake Elsinore	28,928	50,490	7.1	53,926	58,496	0.9
La Quinta	23,694	43,229	7.8	70,237	78,898	1.3
Coachella	22,724	39,014	7.0	36,810	40,463	1.1
San Jacinto	23,779	37,475	5.9	39,433	47,127	2.0
Norco	24,157	26,455	1.1	80,537	78,141	–0.3
Desert Hot Springs	16,582	23,996	4.7	33,459	38,465	1.6
Blythe	12,155	21,650	7.5	45,480	37,937	–2.0
Rancho Mirage	13,249	16,651	2.9	77,027	NA[b]	NA
Canyon Lake	9,952	11,064	1.3	90,263	NA	NA
Calimesa	7,139	7,478	0.6	48,731	NA	NA
Indian Wells	3,816	5,113	3.7	121,008	NA	NA

[a] Data are averages for the period 2006 to 2008.

[b] NA = data not available.

Source: U.S. Bureau of the Census (2009b–d).

majority of these cities are part of the larger urban region that includes Los Angeles, Riverside and San Bernardino, and most are more than 100 mi (161 km) from the site of the proposed SEZ.

Population growth rates among the larger cities in the western part of the county have varied over the period 2000 and 2008. Murietta grew at an annual rate of 10.4% during this period; higher than average growth was also experienced in Lake Elsinore (7.1%), Temecula (6.5%) and San Jacinto (5.9%). The cities of Hemet (2.3%), Corona (2.2%), Riverside (1.8%) all experienced lower growth rates between 2000 and 2008.

A smaller group of cities is about 70 mi (113 km) from the SEZ site, including Indio (83,475), Cathedral City (51,790), Palm Desert (50,490), Coachella (39,014), La Quinta (43,229), and Desert Hot Springs (23,996). Population growth in these cities between 2000 and 2008 has been relatively high: La Quinta (7.8%), Coachella (7.0%), Indio (6.9%), and Desert Hot Springs (4.7%). One city, Blythe (21,650), is located on the eastern border of the county, on the Colorado River, less than 10 mi (16 km) from the proposed SEZ location, and had a relatively high population growth rate (7.5%) between 2000 and 2008.

9.4.19.1.4 ROI Urban Income

Median household incomes varied considerably across cities in the county. A number of cities in the western San Bernardino County—Murietta ($79,135), Norco ($78,141), and Temecula ($77,394)—had median incomes in 2006-2008 that were higher than the average for the state ($61,154) (Table 9.4.19.1-4). A number of cities in the western portion of the county had relatively low median household incomes, notably, Hemet ($34,974) and San Jacinto ($47,127).

Among the cities in the western part of the county, median income growth rates between 1999 and 2006 to 2008 were highest in San Jacinto (2.0%) and Perris (1.7%), with annual growth rates of less than 1% elsewhere. Moreno Valley (–1.1%) and Norco (–0.3%) had negative growth rates between 1999 and 2006 to 2008. The average median household income growth rate for the state as a whole over this period was less than 0.1%.

Elsewhere in the county, La Quinta ($78,898) had a median household income higher than the state average between 2006 and 2008, while other cities—Palm Desert ($55,218), Indio ($53,824), Cathedral City ($42,026), Coachella ($40,463), and Desert Hot Springs ($38,465)—had median incomes less than the state average. The median income in Blythe in 2006 to 2008 was $37,937. Growth rates in these cities over the period 1999 and 2006–2008 varied from 2.1% in Indio to −2.0% in Blythe.

9.4.19.1.5 ROI Population

Table 9.4.19.1-5 presents recent and projected populations in Riverside County and in the state as a whole. Population in the county stood at 2,087,917 in 2008, having grown at an average annual rate of 3.8% since 2000. Population growth in the county was higher than that for California (1.5%) over the same period. The county population is expected to increase to 2,965,113 by 2021 and to 3,085,643 by 2023.

9.4.19.1.6 ROI Income

Total personal income in Riverside County stood at $63.1 billion in 2007 and has grown at an annual average rate of 4.1% over the period 1998 to 2007 (Table 9.4.19.1-6). Per-capita

TABLE 9.4.19.1-5 ROI Population for the Proposed Riverside East SEZ

Location	2000	2008	Average Annual Growth Rate, 2000–2008 (%)	2021	2023
Riverside County	1,559,039	2,087,917	3.8	2,965,113	3,085,643
California	33,871,648	38,129,628	1.5	44,646,420	45,667,413

Sources: U.S. Bureau of the Census (2009e,f); California Department of Finance (2010).

TABLE 9.4.19.1-6 ROI Personal Income for the Proposed Riverside East SEZ

Location	1998	2007	Average Annual Growth Rate, 1998–2007 (%)
Riverside County			
Total income[a]	42.2	63.1	4.1
Per-capita income	28,886	30,713	0.6
California			
Total income[a]	1,231.7	1,573.6	2.5
Per-capita income	37,339	41,821	1.1

[a] Unless indicated otherwise, values are reported in $ billion 2008.

Sources: U.S. Department of Commerce (2009); U.S. Bureau of Census (2009e,f).

income in the county also rose over the same period at a rate of 0.6%, increasing from $28,886 to $30,713. The personal income growth rate in the county was higher than the state rate (2.5%), but the per-capita income growth rate was slightly lower in the ROI than for California as a whole (1.1%).

Median household income in the ROI stood at $58,168 in Riverside County (U.S. Bureau of the Census 2009d).

9.4.19.1.7 ROI Housing

In 2007, more than 754,415 housing units were located in Riverside County (Table 9.4.19.1-7). Owner-occupied units accounted for approximately 69% of the occupied units in the two counties, with rental housing making up 31% of the total. Vacancy rates in 2007 were 14.2% in Riverside County, and 6.5% of housing units in Riverside County were used for seasonal or recreational purposes. With an overall vacancy rate of 14.2% in the county, there were 106,972 vacant housing units in 2007, of which 33,280 are estimated to be rental units that would be available to construction workers. There were 38,208 seasonal, recreational, or occasional-use units vacant at the time of the 2000 Census.

Housing stock in Riverside County grew at an annual rate of 3.7% over the period 2000 to 2007, with 169,741 new units added to the existing housing stock (Table 9.4.19.1-7).

The median value of owner-occupied housing in Riverside County in 2006–2008 was $380,600 (U.S. Bureau of the Census 2009g).

9.4.19.1.8 ROI Local Government Organizations

The various local and county government organizations in Riverside County are listed in Table 9.4.19.1-8. In addition, there are 11 tribal governments located in the county; members of other tribal groups are located in the state, but their tribal governments are located in adjacent states.

9.4.19.1.9 ROI Community and Social Services

This section describes educational, health care, law enforcement, and firefighting resources in the ROI.

TABLE 9.4.19.1-7 ROI Housing Characteristics for the Proposed Riverside East SEZ

Parameter	2000	2007
Riverside County		
Owner-occupied	348,532	446,017
Rental	157,686	201,426
Vacant units	78,456	106,972
Seasonal and recreational use	38,208	NA[a]
Total units	584,674	754,415

[a] NA = data not available.

Sources: U.S. Bureau of the Census (2009h,i).

TABLE 9.4.19.1-8 ROI Local Government Organizations and Social Institutions for the Proposed Riverside East SEZ

Governments	
City	
Blythe	Lake Elsinore
Calimesa	Moreno Valley
Canyon Lake	Murietta
Cathedral City	Norco
Coachella	Palm Desert
Corona	Perris
Desert Hot Springs	Rancho Mirage
Hemet	Riverside
Indian Wells	San Jacinto
Indio	Temecula
La Quinta	
County	
Riverside County	
Tribal	
Agua Caliente Band of Cahuilla Indians of the Agua Caliente Indian Reservation, California	
Augustine Band of Cahuilla Mission Indians of the Augustine Reservation, California	
Cabazon Band of Mission Indians, California	
Cahuilla Band of Mission Indians of the Cahuilla Reservation, California	
Ione Band of Miwok Indians of California	
Morongo Band of Cahuilla Mission Indians of the Morongo Reservation, California	
Pechanga Band of Luiseno Mission Indians of the Pechanga Reservation, California	
Ramona Band or Village of Cahuilla Mission Indians of California	
Santa Rosa Band of Cahuilla Indians, California	
Soboba Band of Luiseno Indians, California	
Torres Martinez Desert Cahuilla Indians, California	

Sources: U.S. Bureau of the Census (2009b); U.S. Department of Interior (2010).

Schools

Table 9.4.19.1-9 provides summary statistics for enrollment and educational staffing and two indices of educational quality—student-teacher ratios and levels of service (number of teachers per 1,000 population). The student-teacher ratio in Riverside County schools in 2007 was 22.1, while the level of service is slightly higher in Riverside County was 9.3.

Health Care

There were 3,277 physicians in Riverside County in 2007, and the number of doctors per 1,000 population was 1.6 (Table 9.4.19.1-10).

TABLE 9.4.19.1-9 ROI School District Data for the Proposed Riverside East SEZ, 2007

Location	Number of Students	Number of Teachers	Student-Teacher Ratio	Level of Service[a]
Riverside County	421,642	19,105	22.1	9.3

[a] Number of teachers per 1,000 population.

Source: NCES (2009).

TABLE 9.4.19.1-10 Physicians in the ROI for the Proposed Riverside East SEZ, 2007

Location	Number of Primary Care Physicians	Level of Service[a]
Riverside County	3,277	1.6

[a] Number of physicians per 1,000 population.

Source: AMA (2009).

Public Safety

Riverside County has 1,965 officers and would provide law enforcement services to the SEZ (Table 9.4.19.1-11), and currently, there are 2,205 professional firefighters in the. Levels of service of police protection are 1.0 in Riverside County and 1.1 for fire services.

9.4.19.1.10 ROI Social Change

Community social structures and other forms of social organization within the ROI are related to various factors, including historical development, major economic activities and sources of employment, income levels, race and ethnicity, and forms of local political organization. Although an analysis of the character of community social structures is beyond the scope of the current programmatic analysis, project-level NEPA analyses would include a description of ROI social structures, contributing factors, their uniqueness, and consequently, the susceptibility of local communities to various forms of social disruption and social change.

Various energy development studies have suggested that once the annual growth in population is between 5% and 15% in smaller rural communities, alcoholism, depression, suicide, social conflict, divorce, and delinquency would increase, and levels of community satisfaction would deteriorate (BLM 1980, 1983, 1996). Tables 9.4.19.1-12 and 9.4.19.1-13 present data for a number of indicators of social change, including violent crime and property

TABLE 9.4.19.1-11 Public Safety Employment in the ROI

Location	Number of Police Officers[a]	Level of Service[b]	Number of Firefighters[c]	Level of Service
Riverside County	1,965	1.0	2,205	1.1

[a] 2007 data.

[b] Number per 1,000 population.

[c] 2008 data; number does not include volunteers.

Sources: U.S. Department of Justice (2008); Fire Departments Network (2009).

TABLE 9.4.19.1-12 County and ROI Crime Rates in the ROI for the Proposed Riverside East SEZ[a]

	Violent Crime[b]		Property Crime[c]		All Crime	
	Offenses	Rate	Offenses	Rate	Offenses	Rate
Riverside County	7,351	3.5	57,839	27.5	65,190	31.0

[a] Rates are the number of crimes per 1,000 population.

[b] Violent crime includes murder and non-negligent manslaughter, forcible rape, robbery, and aggravated assault.

[c] Property crime includes burglary, larceny, theft, motor vehicle theft, and arson.

Sources: U.S. Department of Justice (2009a, b).

crime rates, alcoholism and illicit drug use, and metal health and divorce, that might be used to indicate social change.

Violent crime in Riverside County in 2007 stood at 3.5 per 1,000 population (Table 9.4.19.1-12), while the property-related crime rate was 27.5, producing an overall crime rate of 31.0.

Other measures of social change—alcoholism, illicit drug use, and mental health—are not available at the county level, and thus are presented for the SAMHSA region in which the county is located (Table 9.4.19.1-13).

9.4.19.1.11 ROI Recreation

There are various areas in the vicinity of the proposed SEZ that are used for recreational purposes, with natural, ecological, and cultural resources in the ROI attracting visitors for a

TABLE 9.4.19.1-13 Alcoholism, Drug Use, Mental Health, and Divorce in the Proposed Riverside East SEZ ROI[a]

Geographic Area	Alcoholism	Illicit Drug Use	Mental Health[b]	Divorce[c]
California Region 13 (includes Riverside County)	8.5	3.2	8.6	–[d]
California				4.3

[a] Data for alcoholism and drug use represent the percentage of the population over 12 years of age with dependence or abuse of alcohol, illicit drugs. Data are averages for 2004 to 2006.

[b] Data for mental health represent the percentage of the population over 18 years of age suffering from serious psychological distress. Data are averages for 2002 to 2004.

[c] Divorce rates are the number of divorces per 1,000 population. Data are for 1990.

[d] A dash indicates not applicable.

Sources: SAMHSA (2009); CDC (2009).

range of activities, including hunting, fishing, boating, canoeing, wildlife watching, camping, hiking, horseback riding, mountain climbing, and sightseeing. These areas are discussed in Section 9.4.5.

Because the number of visitors using state and federal lands for recreational activities is not available from the various administering agencies, the value of recreational resources in these areas, based solely on the number of recorded visitors is likely to be an underestimation. In addition to visitation rates, the economic valuation of certain natural resources can also be assessed in terms of the potential recreational destination for current and future users, that is, their nonmarket value (see Section 5.17.1.1.1).

Another method is to estimate the economic impact of the various recreational activities supported by natural resources on public land in the vicinity of the proposed solar development, by identifying sectors in the economy in which expenditures on recreational activities occur. Not all activities in these sectors are directly related to recreation on state and federal lands, with some activity occurring on private land (e.g., dude ranches, golf courses, bowling alleys, and movie theaters). Expenditures associated with recreational activities form an important part of the economy of the ROI. In 2007, 75,858 people were employed in Riverside County in the various sectors identified as recreation, constituting 8.9% of total ROI employment (Table 9.4.19.1-14). Recreation spending also produced almost $1,871 million in income in the ROI in 2007. The primary sources of recreation-related employment were eating and drinking places.

TABLE 9.4.19.1-14 ROI Recreation Sector Activity for the Proposed Riverside East SEZ, 2007

ROI	Employment	Income ($ million)
Amusement and recreation services	5,289	172.5
Automotive rental	605	27.5
Eating and drinking places	54,938	1,130.4
Hotels and lodging places	8,589	300.7
Museums and historic sites,	299	21.6
Recreational vehicle parks and campsites	602	16.8
Scenic tours	1,742	114.5
Sporting goods retailers	3,794	86.5
Total ROI	75,858	1,870.5

Source: MIG, Inc. (2009).

9.4.19.2 Impacts

The following analysis begins with a description of the common impacts of solar development, including common impacts on recreation and on social change. These impacts would occur regardless of the solar technology developed in the SEZ. The impacts of facilities employing various solar energy technologies are analyzed in detail in subsequent sections.

9.4.19.2.1 Common Impacts

Construction and operation of a solar energy facility at the proposed Riverside East SEZ would produce direct and indirect economic impacts. Direct impacts would occur as a result of expenditures on wages and salaries, procurement of goods and services required for project construction and operation, and the collection of state sales and income taxes. Indirect impacts would occur as project wages and salaries, procurement expenditures, and tax revenues subsequently circulate through the economy of each state, thereby creating additional employment, income, and tax revenues. Facility construction and operation would also require in-migration of workers and their families into the ROI surrounding the site, and this would affect population, rental housing, health service employment, and public safety employment. Socioeconomic impacts common to all utility-scale solar energy facilities are discussed in detail in Section 5.17. These impacts will be minimized through the implementation of programmatic design features described in Appendix A, Section A.2.2.

Recreation Impacts

Estimating the impact of solar facilities on recreation is problematic because it is not clear how solar development in the SEZ would affect recreational visitation and nonmarket values (i.e., the value of recreational resources for potential or future visits; see Section 5.17.1.2.3). While it is clear that some land in the ROI would no longer be accessible for recreation, the majority of popular recreational locations would be precluded from solar development. It is also possible that solar facilities in the ROI would be visible from popular recreation locations and that construction workers residing temporarily in the ROI would occupy accommodations otherwise used for recreational visits, thus reducing visitation and consequently affecting the economy of the ROI.

Social Change

Although an extensive literature in sociology documents the most significant components of social change in energy boomtowns, the nature and magnitude of the social impact of energy facilities in small rural communities are still unclear (see Section 5.17.1.1.4). While some degree of social disruption is likely to accompany large-scale in-migration during the boom phase, there is insufficient evidence to predict the extent to which specific communities are likely to be affected, which population groups within each community are likely to be most affected, and the extent to which social disruption is likely to persist beyond the end of the boom period (Smith et al. 2001). Accordingly, because of the lack of adequate social baseline data, it has been suggested that social disruption is likely to occur once an arbitrary population growth rate associated with solar energy development projects has been reached, with an annual rate of between 5% and 10% growth in population assumed to result in a breakdown in social structuresand a consequent increase in alcoholism, depression, suicide, social conflict, divorce, delinquency, and deterioration in levels of community satisfaction (BLM 1980, 1983, 1996).

In overall terms, the in-migration of workers and their families into the ROI would represent an increase of 0.1% in county population during construction of the trough technology, with smaller increases for the power tower, dish engine, and PV technologies, and during the operation of each technology. While it is possible that some construction and operations workers will choose to locate in communities closer to the SEZ, the lack of available housing in smaller rural communities in the ROI to accommodate all in-migrating workers and families, and the insufficient range of housing choices to suit all solar occupations, many workers are likely to commute to the SEZ from larger communities elsewhere in the ROI, thereby reducing the potential impact of solar facilities on social change. Regardless of the pace of population growth associated with the commercial development of solar resources and the likely residential location of in-migrating workers and families in communities some distance from the SEZ itself, the number of new residents from outside the ROI is likely to lead to some demographic and social change in small rural communities in the ROI. Communities hosting solar facilities are likely to be required to adapt to a different quality of life, with a transition away from a more traditional lifestyle involving ranching and taking place in small, isolated, close-knit, homogenous communities with a strong orientation toward personal and family relationships, toward a more urban lifestyle, with increasing cultural and ethnic diversity, and increasing dependence on formal social relationships within the community.

9.4.19.2.2 Technology-Specific Impacts

The economic impacts of solar energy development in the proposed SEZ were measured in terms of employment, income, state tax revenues (sales and income), population in-migration, housing, and community service employment (education, health, and public safety). More information on the data and methods used in the analysis are provided in Appendix M.

The assessment of the impact of the construction and operation of each technology was based on SEZ acreage, assuming 80% of the area could be developed. To capture a range of possible impacts, solar facility size was estimated on the basis of land requirements of various solar technologies, assuming that 9 acres/MW (0.04 km^2/MW) would be required for power tower, dish engine, and PV technologies, and 5 acres/MW (0.02 km^2/MW) for solar trough technologies. Impacts of multiple facilities employing a given technology at each SEZ were assumed to be the same as impacts for a single facility with the same total capacity. Construction impacts were assessed for a representative peak year of construction, assumed to be 2021 for each technology. Construction impacts assumed that a maximum of three projects could be constructed within a given year, with a corresponding maximum land disturbance of up to 9,000 acres (36 km^2). For operations impacts, a representative first year of operations was assumed to be 2023 for trough and power tower, 2022 for the minimum facility size for dish engine and PV, and 2023 for the maximum facility size for these technologies. The years of construction and operations were selected as representative of the entire 20-year study period, because they are the approximate midpoint; construction and operations could begin earlier.

Solar Trough

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of solar trough technologies would be up to 15,633 jobs (Table 9.4.19.2-1). Construction activities would constitute 1.3% of total ROI employment. A solar development would also produce $927.3 million in income. Direct sales taxes would be $41.2 million; direct income taxes $18.9 million.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility means that some in-migration of workers and their families from outside the ROI would be required, with 2,229 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) would mean that the impact of solar facility construction on the number of vacant rental housing units is not expected to be large, with 1,114 rental units expected to be occupied in the ROI. This occupancy rate would represent 2.3% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would also affect community service employment (education, health, and public safety. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly,

TABLE 9.4.19.2-1 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Riverside East SEZ with Trough Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	5,232	7,079
Total	15,633	11,670
Income[b]		
Total	927.3	423.9
Direct state taxes[b]		
Sales	41.2	0.5
Income	18.9	11.2
BLM payments ($ million 2008)		
Rental	NA[d]	63.7
Capacity[e]	NA	213.5
In-migrants (no.)	2,229	902
Vacant housing[c] (no.)	1,114	812
Local community service employment		
Teachers (no.)	21	8
Physicians (no.)	4	1
Public safety (no.)	5	2

a Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 1,800 MW (corresponding to 9,000 acres [36 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 32,469 MW.

b Unless indicated otherwise, values are reported in $ million 2008.

c Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

d Not applicable.

e The BLM annual capacity payment was based on a fee of $6,570 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010f), assuming a solar facility with no storage capability, and full build-out of the site. Projects with three or more hours of storage would generate higher payments, based on a fee of $7,884 per MW.

21 new teachers, 4 physicians, and 5 public safety employees (career firefighters and uniformed police officers) would be required in the ROI. These increases would represent 0.1% of total ROI employment expected in these occupations.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using solar trough technologies would be 11,670 jobs (Table 9.4.19.2-1). Such a solar development would also produce $423.9 million in income. Direct sales taxes would be $0.5 million; direct income taxes $11.2 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010i), acreage rental payments would be $63.7 million, and solar generating capacity payments, at least $213.5 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a solar facility means that some in-migration of workers and their families from outside the ROI would be required, with 902 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility operation on the number of vacant owner-occupied housing units is not expected to be large, with 812 owner-occupied units expected to be occupied in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (health, education, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the provision of these services in the ROI. Accordingly, eight new teachers, one physician, and two public safety employees would be required in the ROI.

Power Tower

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of power tower technologies would be up to 6,227 jobs (Table 9.4.19.2-2). Construction activities would constitute 0.5% of total ROI employment. Such a solar development would also produce $369.3 million in income. Direct sales taxes would be less than $16.4 million; direct income taxes $7.5 million.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility means that some in-migration of workers and their families from outside the ROI would be required, with 888 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units is not expected to be large, with

TABLE 9.4.19.2-2 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Riverside East SEZ with Power Tower Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	2,084	3,656
Total	6,227	5,135
Income[b]		
Total	369.3	171.1
Direct state taxes[b]		
Sales	16.4	0.1
Income	7.5	5.8
BLM payments ($ million 2008)		
Rental	NA[d]	63.7
Capacity[e]	NA	118.6
In-migrants (no.)	888	466
Vacant housing[c] (no.)	444	419
Local community service employment		
Teachers (no.)	8	4
Physicians (no.)	1	1
Public safety (no.)	2	1

[a] Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 1,000 MW (corresponding to 9,000 acres [36 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 18,038 MW.

[b] Unless indicated otherwise, values are reported in $ million 2008.

[c] Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

[d] Not applicable.

[e] The BLM annual capacity payment was based on a fee of $6,570 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010i), assuming a solar facility with no storage capability, and full build-out of the site. Projects with three or more hours of storage would generate higher payments, based on a fee of $7,884 per MW.

444 rental units expected to be occupied in the ROI. This occupancy rate would represent 0.5% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, eight new teachers, one physician, and two public safety employees would be required in the ROI. These increases would represent less than 0.1% of total ROI employment expected in these occupations.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using power tower technologies would be 5,135 jobs (Table 9.4.19.2-2). Such a solar development would also produce $171.1 million in income. Direct sales taxes would be less than $0.1 million; direct income taxes $5.8 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010i), acreage rental payments would be $63.7 million, and solar generating capacity payments, at least $118.6 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a solar facility means that some in-migration of workers and their families from outside the ROI would be required, with 466 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels and mobile home parks) would mean that the impact of solar facility operation on the number of vacant owner-occupied housing units is not expected to be large, with 419 owner-occupied units expected to be required in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, four new teachers, one physician and one public safety employee would be required in the ROI.

Dish Engine

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of dish engine technologies would be up to 2,531 jobs (Table 9.4.19.2-3). Construction activities would constitute 0.2% of total ROI employment. Such a solar development would also produce $150.1 million in income. Direct sales taxes would be less than $6.7 million, with direct income taxes of $3.1 million.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility means that some in-migration of workers and their families from outside the ROI would be required, with

TABLE 9.4.19.2-3 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Riverside East SEZ with Dish Engine Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	847	3,553
Total	2,531	4,990
Income[b]		
Total	150.1	166.2
Direct state taxes[b]		
Sales	6.7	0.1
Income	3.1	5.6
BLM payments ($ million 2008)		
Rental	NA[d]	63.7
Capacity[e]	NA	118.6
In-migrants (no.)	361	453
Vacant housing[c] (no.)	180	407
Local community service employment		
Teachers (no.)	3	4
Physicians (no.)	1	1
Public safety (no.)	1	1

a Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 1,000 MW (corresponding to 9,000 acres [36 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 18,038 MW.

b Unless indicated otherwise, values are reported in $ million 2008.

c Construction activities would affect vacant rental housing; operations activities would affect vacant owner-occupied housing.

d Not applicable.

e The BLM annual capacity payment was based on a fee of $6,570 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010i), assuming a solar facility with no storage capability, and full build-out of the site. Projects with three or more hours of storage would generate higher payments, based on a fee of $7,884 per MW.

361 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units is not expected to be large, with 180 rental units expected to be occupied in the ROI. This occupancy rate would represent 0.4% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, three new teachers, one physician, and one public safety employee would be required in the ROI. These increases would represent less than 0.1% of total ROI employment expected in these occupations.

Operations. Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using dish engine technologies would be 4,990 jobs (Table 9.4.19.2-3). Such a solar development would also produce $166.2 million in income. Direct sales taxes would be $0.1 million; direct income taxes $5.6 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010i), acreage rental payments would be $63.7 million, and solar generating capacity payments, at least $118.6 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a dish engine solar facility means that some in-migration of workers and their families from outside the ROI would be required, with 453 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility operation on the number of vacant owner-occupied housing units is not expected to be large, with 407 owner-occupied units expected to be required in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service employment (education, health, and public safety). An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, four new teachers, one physician, and one public safety employee would be would be required in the ROI.

Photovoltaic

Construction. Total construction employment impacts in the ROI (including direct and indirect impacts) from the use of PV technologies would be up to 1,181 jobs (Table 9.4.19.2-4). Construction activities would constitute 0.1 % of total ROI employment. Such a solar

TABLE 9.4.19.2-4 ROI Socioeconomic Impacts Assuming Full Build-out of the Proposed Riverside East SEZ with PV Facilities[a]

Parameter	Maximum Annual Construction Impacts	Operations Impacts
Employment (no.)		
Direct	395	354
Total	1,181	498
Income[b]		
Total	70.0	16.6
Direct state taxes[b]		
Sales	3.1	<0.1
Income	1.4	0.6
BLM payments ($ million 2008)		
Rental	NA[d]	63.7
Capacity[e]	NA	94.9
In-migrants (no.)	168	45
Vacant housing[c] (no.)	84	41
Local community service employment		
Teachers (no.)	2	0
Physicians (no.)	0	0
Public safety (no.)	0	0

a Construction impacts are based on the development at the site in a single year; it was assumed that several facilities with a combined capacity of up to 1,000 MW (corresponding to 9,000 acres [36 km^2] of land disturbance) could be built. Operations impacts were based on full build-out of the site, producing a total output of 18,038 MW.

b Unless indicated otherwise, values are reported in $ million 2008.

c Construction activities would affect vacant rental housing; operations activities would affect owner-occupied housing.

d Not applicable.

e The BLM annual capacity payment was based on a fee of $5,256 per MW, established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010i), assuming full build-out of the site.

development would also produce $70.0 million in income. Direct sales taxes would be less than $3.1 million; direct income taxes, of $1.4 million.

Given the scale of construction activities and the likelihood of local worker availability in the required occupational categories, construction of a solar facility means that some in-migration of workers and their families from outside the ROI would be required, with 168 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility construction on the number of vacant rental housing units is not expected to be large, with 84 rental units expected to be occupied in the ROI. This occupancy rate would represent 0.2% of the vacant rental units expected to be available in the ROI.

In addition to the potential impact on housing markets, in-migration would affect community service (education, health, and public safety) employment. An increase in such employment would be required to meet existing levels of service in the ROI. Accordingly, two new teachers would be required in the ROI. This increase would represent less than 0.1% of total ROI employment expected in this occupation.

***Operations*.** Total operations employment impacts in the ROI (including direct and indirect impacts) of a build-out using PV technologies would be 498 jobs (Table 9.4.19.2-4). Such a solar development would also produce $16.6 million in income. Direct sales taxes would be less than $0.1 million; direct income taxes less than $0.6 million. Based on fees established by the BLM in its Solar Energy Interim Rental Policy (BLM 2010i), acreage rental payments would be $63.7 million, and solar generating capacity payments, at least $94.9 million.

Given the likelihood of local worker availability in the required occupational categories, operation of a solar facility means that some in-migration of workers and their families from outside the ROI would be required, with 45 persons in-migrating into the ROI. Although in-migration may potentially affect local housing markets, the relatively small number of in-migrants and the availability of temporary accommodations (hotels, motels, and mobile home parks) mean that the impact of solar facility operation on the number of vacant owner-occupied housing units is not expected to be large, with 41 owner-occupied units expected to be required in the ROI.

No new community service employment would be required to meet existing levels of service in the ROI.

9.4.19.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features addressing socioeconomic impacts have been identified for the proposed Riverside East SEZ. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM's proposed Solar Energy Program, would reduce the potential for socioeconomic impacts during all project phases.

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9.4.20 Environmental Justice

9.4.20.1 Affected Environment

On February 11, 1994, the President signed E. O. 12898,"Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," which formally requires federal agencies to incorporate environmental justice as part of their missions (*Federal Register*, Volume 59, page 7629, Feb. 11, 1994). Specifically, it directs them to address, as appropriate, any disproportionately high and adverse human health or environmental effects of their actions, programs, or policies on minority and low-income populations.

The analysis of the impacts of solar energy projects on environmental justice issues follows guidelines described in the CEQ's *Environmental Justice Guidance under the National Environmental Policy Act* (CEQ 1997). The analysis method has three parts: (1) a description of the geographic distribution of low-income and minority populations in the affected area is undertaken; (2) an assessment is conducted to determine whether construction and operation would produce impacts that are high and adverse; and (3) if impacts are high and adverse, a determination is made as to whether they disproportionately affect minority and low-income populations.

Construction and operation of solar energy projects in the proposed Riverside East SEZ could affect environmental justice if any adverse health and environmental impacts resulting from either phase of development are significantly high and if these impacts would disproportionately affect minority and low-income populations. If the analysis determines that health and environmental impacts are not significant, there can be no disproportionate impacts on minority and low-income populations. In the event impacts are significant, disproportionality would be determined by comparing the proximity of any high and adverse impacts with the location of low-income and minority populations.

The analysis of environmental justice issues associated with the development of solar facilities considered impacts within the proposed Riverside East SEZ and an associated 50-mi (80-km) radius around the boundary of the SEZ. A description of the geographic distribution of minority and low-income groups in the affected area was based on demographic data from the 2000 Census (U.S. Bureau of the Census 2009k,l). The following definitions were used to define minority and low-income population groups:

- **Minority.** Persons are included in the minority category if they identify themselves as belonging to any of the following racial groups: (1) Hispanic, (2) Black (not of Hispanic origin) or African American, (3) American Indian or Alaska Native, (4) Asian, or (5) Native Hawaiian or Other Pacific Islander.

  Beginning with the 2000 Census, where appropriate, the census form allows individuals to designate multiple population group categories to reflect their ethnic or racial origin. In addition, persons who classify themselves as being of multiple racial origin may choose up to six racial groups as the basis of

their racial origins. The term minority includes all persons, including those classifying themselves in multiple racial categories, except those who classify themselves as not of Hispanic origin and as White or "Other Race" (U.S. Bureau of the Census 2009k).

The CEQ guidance proposed that minority populations should be identified where either (1) the minority population of the affected area exceeds 50%, or (2) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis.

The PEIS applies both criteria in using the Census Bureau data for census block groups, wherein consideration is given to the minority population that is both greater than 50% and 20 percentage points higher than in the state (the reference geographic unit).

- Low-Income. Individuals fall below the poverty line. The poverty line takes into account family size and age of individuals in the family. In 1999, for example, the poverty line for a family of five with three children younger than 18 was $19,882. For any given family below the poverty line, all family members are considered as being below the poverty line for the purposes of analysis (U.S. Bureau of the Census 2009l).

The data in Table 9.4.20.1-1 show the minority and low-income composition of the total population located in the proposed SEZ based on 2000 Census data and CEQ guidelines. Individuals identifying themselves as Hispanic or Latino are included in the table as a separate entry. However, because Hispanics can be of any race, this number also includes individuals also identifying themselves as being part of one or more of the population groups listed in the table.

A large number of minority and low-income individuals are located in the 50-mi (80-km) area around the boundary of the SEZ. Within the 50-mi (80-km) radius in Arizona, 24.5% of the population is classified as minority, while 13.0% is classified as low-income. The number of minority individuals does not exceed 50% of the total population in the area, and the number of minority individuals exceeds the state average by 20 percentage points or more, meaning that there is no minority population in the SEZ area based on 2000 Census data and CEQ guidelines. The number of low-income individuals does not exceed the state average by 20 percentage points or more and does not exceed 50% of the total population in the area, meaning that there are no low-income populations in the SEZ.

Within the 50-mi (80-km) radius in California, 60.3% of the population is classified as minority, while 20.5% is classified as low-income. While the number of minority individuals does not exceed the state average by 20 percentage points or more, the number of minority individuals exceeds 50% of the total population in the area meaning that there is a minority population in the SEZ as a whole area based on 2000 Census data and CEQ guidelines. The number of low-income individuals does not exceed the state average by 20 percentage points or

TABLE 9.4.20.1-1 Minority and Low-Income Populations within the 50-mi (80-km) Radius Surrounding the Proposed Riverside East SEZ

Parameter	Arizona	California
Total population	66,364	255,043
White, non-Hispanic	53,608	101,207
Hispanic or Latino	8,717	131,953
Non-Hispanic or Latino minorities	4,039	21,883
One race	3,196	18,253
Black or African American	354	11,721
American Indian or Alaskan Native	2,426	2,184
Asian	341	3,513
Native Hawaiian or Other Pacific Islander	46	453
Some other race	29	382
Two or more races	843	3,630
Total minority	12,756	153,836
Low-income	8,496	46,222
Percentage minority	19.2	60.3
State percent minority	24.5	40.5
Percentage low-income	13.0	20.5
State percent low-income	13.9	14.2

Source: U.S Bureau of the Census (2009k,l).

more and does not exceed 50% of the total population in the area, meaning that there are no low-income populations in the SEZ as a whole.

Figures 9.4.20.1-1 and 9.4.20.1-2 show the locations of the minority and low-income population groups within the 50-mi (80-km) radius around the boundary of the SEZ.

In the California portion of the 50-mi (80-km) radius around the SEZ, more than 50% of the population is classified as minority in block groups located in the city of Blythe itself and to the immediate west and southwest of the city; in the western part of the county in the vicinity of Desert Hot Springs; in Imperial County in the vicinity of Calipatria and Westmoreland; and in the Fort Yuma Indian Reservation in the Colorado River valley. Block groups with a minority population which is more than 20 percentage points higher than the state average are located in the city of Blythe, to the immediate west of the city, and in the western portions of the 50-mi (80-km) radius in the vicinity of Indio and Coachella. In the Arizona portion of the 50-mi (80-km) radius, more than 50% of the population is classified as minority in block groups located

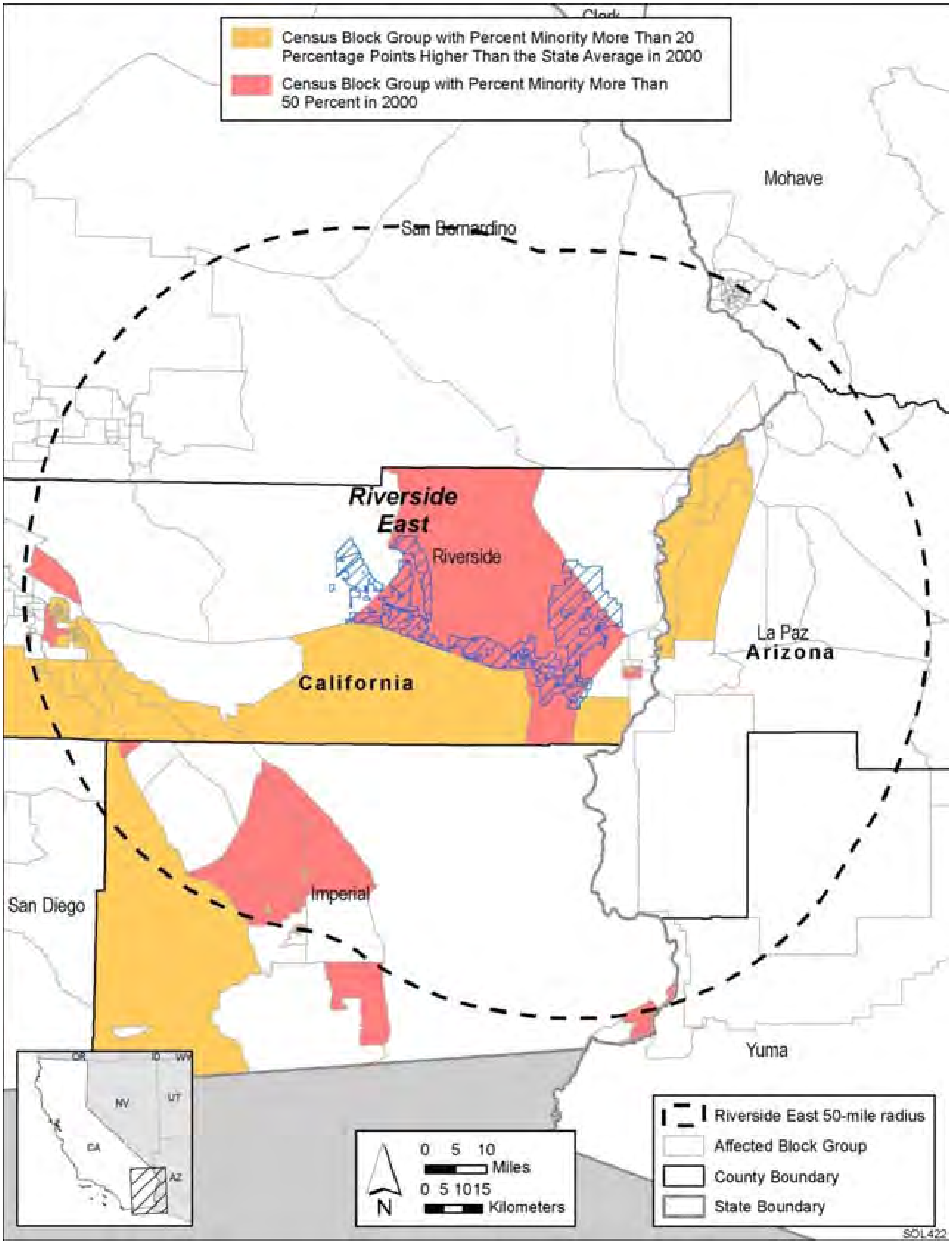

FIGURE 9.4.20.1-1 Minority Population Groups within the 50-mi (80-km) Radius Surrounding the Proposed Riverside East SEZ

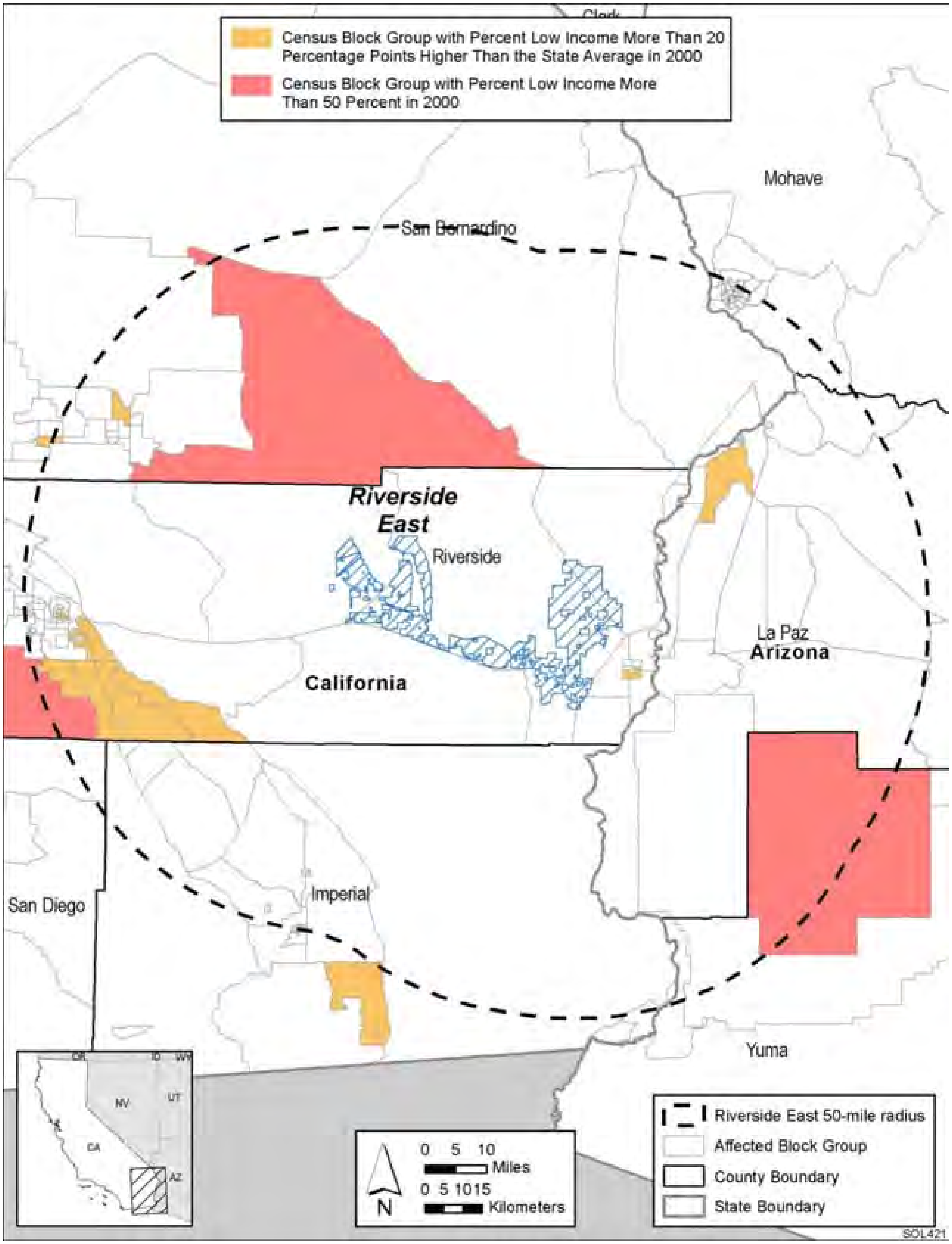

FIGURE 9.4.20.1-2 Low-Income Population Groups within the 50-mi (80-km) Radius Surrounding the Proposed Riverside East SEZ

in the Colorado River Indian Reservation, in the city of Parker, and to the east of the Colorado River, south of Blythe.

Census block groups in the 50-mi (80-km) radius in California that have more than 50% of their population classified as low-income are located in the vicinity of the city of Twentynine Palms, in the western portion of Riverside County, and in Arizona, to the northeast of Yuma. Census block group in California where the low-income population is more than 20 percentage points higher than the state average, are located in the city of Blyth, in the western portion of the county, in the Colorado River Indian Reservation, and in the vicinity of the city of Victorville.

9.4.20.2 Impacts

Environmental justice concerns common to all utility-scale solar energy facilities are described in detail in Section 5.18. These impacts will be minimized through the implementation of programmatic design features described in Appendix A, Section A.2.2, which address the underlying environmental impacts contributing to the concerns. The potentially relevant environmental impacts associated with solar facilities within the proposed Riverside East SEZ include noise and dust during the construction of solar facilities; noise and EMF effects associated with solar project operations; the visual impacts of solar generation and auxiliary facilities, including transmission lines; access to land used for economic, cultural, or religious purposes; and effects on property values as areas of concern that might potentially affect minority and low-income populations.

Potential impacts on low-income and minority populations could be incurred as a result of the construction and operation of solar facilities involving each of the four technologies. Although impacts are likely to be small, there are minority populations defined by CEQ guidelines (Section 9.4.20.1) within the 50-mi (80-km) radius around the boundary of the SEZ, meaning that any adverse impacts of solar projects could disproportionately affect minority populations. Because there are also low-income populations within the 50-mi (80-km) radius, according to CEQ guidelines, there could also be impacts on low-income populations.

9.4.20.3 SEZ-Specific Design Features and Design Feature Effectiveness

No SEZ-specific design features addressing environmental justice impacts have been identified for the proposed Riverside East SEZ. Implementing the programmatic design features described in Appendix A, Section A.2.2, as required under BLM’s proposed Solar Energy Program, would reduce the potential for environmental justice impacts during all project phases.

9.4.21 Transportation

The proposed Riverside East SEZ is accessible by road. An interstate highway passes through it, and eight small airports are located within 72 mi (116 km) of the SEZ. General transportation considerations and impacts are discussed in Sections 3.4 and 5.19, respectively.

9.4.21.1 Affected Environment

I-10 passes along the southern edge and then through the proposed Riverside East SEZ as shown in Figure 9.4.21-1. The town of Blythe is situated on the eastern border of the SEZ. To the west of the SEZ, I-10 passes through Indio, about 47 mi (76 km) from the western edge of the SEZ, on its way to the Los Angeles area, about 120 mi (193 km) from the SEZ. There are a number of exits from I-10 as it passes by and through the SEZ; they are listed in Table 9.4.21-1. Figure 9.4.21-1 also shows the designated open OHV routes in the proposed Riverside East SEZ. These routes were designated under the CDCA Plan (BLM 1999).

Other paved roads that cross parts of the Riverside East SEZ include State Route 177 and Midland Road. State Route 177 runs north–south through the western section of the SEZ between I-10 and State Route 62. In the eastern section of the SEZ, Midland Road crosses the northeastern portion from Blythe to the ghost town of Midland, which is situated at the northern edge of the eastern section of the SEZ. A number of dirt roads also cross the SEZ at various points. Another major route in the area is U.S. 95, which runs north–south through Blythe and passes within 2 to 4 mi (3 to 6 km) of the eastern edge of the SEZ. Table 9.4.21-2 gives the annual average traffic volumes along I-10 and state roads near the SEZ for 2008.

The nearest operating railroad is the ARZC Railroad, which passes through Rice, about 18 mi (29 km) north of the large eastern section of the proposed Riverside East SEZ. However, the shortest drive from the SEZ to Rice is on Midland Road, a dirt road north of Midland. The Vidal rail stop on the ARZC Railroad is about a 41-mi (66-km) drive via U.S. 95 from the eastern edge of the SEZ. The ARZC Railroad is a regional short line railroad that originates in Cadiz, approximately 50 mi (80 km) northwest of Rice, where it has an interchange with the BNSF Railroad (RailAmerica 2010). The ARZC Railroad continues on from Rice through Vidal to the east for about 150 mi (240 km), passing through Parker, California, and eventually joining with the BNSF Railroad again in Matthie, Arizona, northwest of Phoenix. The next closest railroad to the SEZ is the UP Railroad, which provides service in Indio (UPR 2009).

The ARZC Railroad also has a spur that runs south from Rice through the eastern section of the SEZ and goes to Blythe. However, this spur has become inactive and may be abandoned (Blythe City Council 2008). Another inactive railroad, the Eagle Mountain (EM) Railroad, runs north–south immediately to the west of the large western section of the SEZ and has an interchange with the UP Railroad at Ferrum, approximately 31 mi (50 km) southwest of the southwestern corner of the proposed Riverside East SEZ. The EM Railroad is a private railroad owned by Kaiser Ventures, LLC, that was originally used for hauling iron ore and is currently in need of repair. Kaiser Ventures is seeking to convert its former iron ore mine into a regional municipal solid waste landfill operation (Kaiser Ventures 2010) that would use the railroad for hauling waste to the landfill.

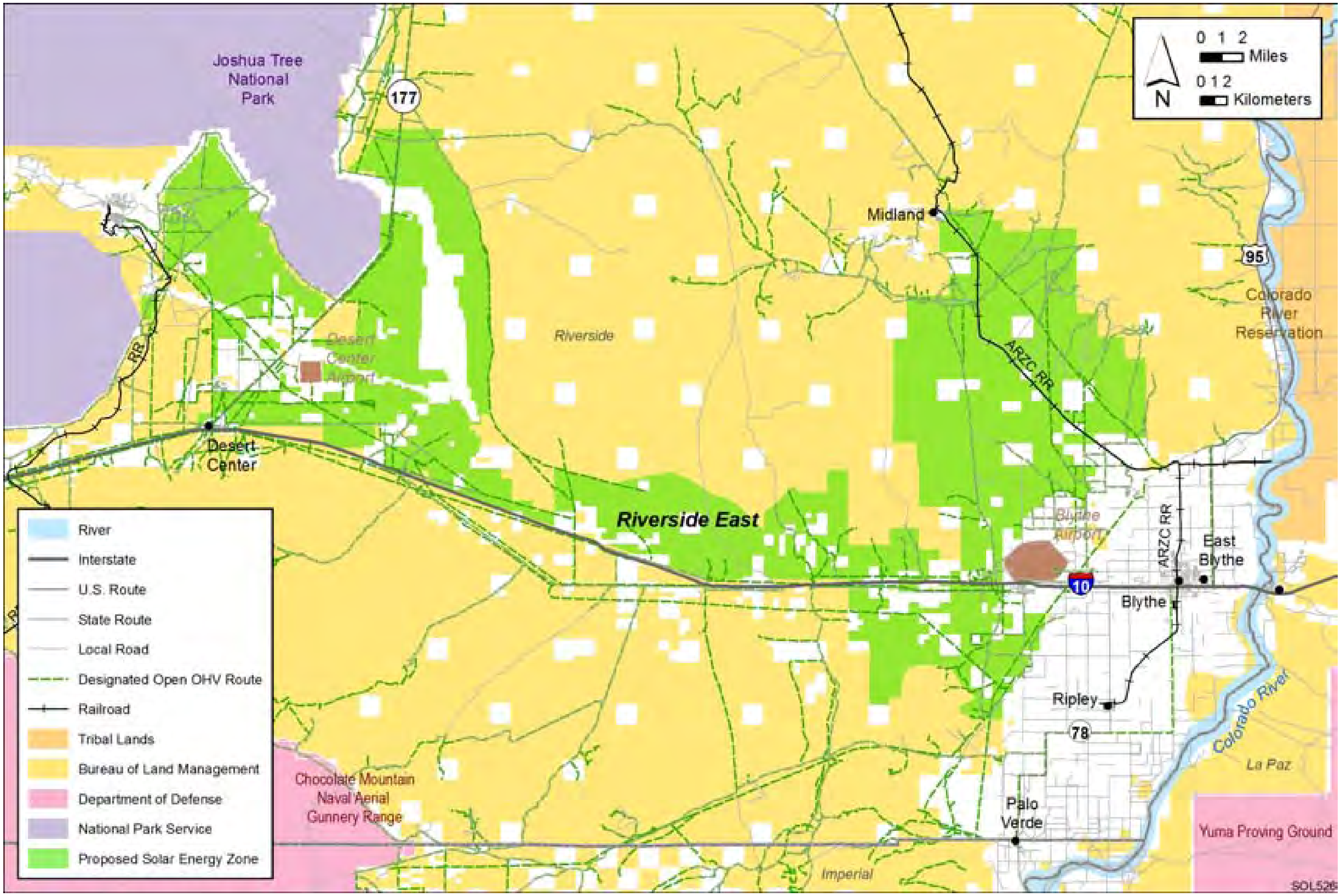

FIGURE 9.4.21.1-1 Local Transportation Network Serving the Proposed Riverside East SEZ

TABLE 9.4.21.1-1 I-10 Freeway Exits in the Vicinity of the Proposed Riverside East SEZ

Road Name	Exit Number/ Mile Marker
Desert Center Rice Road (State Route 177)	192
Corn Springs Road	201
Paled Dunes Drive and Chuckwalla Valley Road	217
Wiley's Well Road	222
Mesa Drive (at Blythe Airport)	232
Neighbours Boulevard (State Route 78) (western side of Blythe)	238

TABLE 9.4.21.1-2 AADT on Major Roads near the Proposed Riverside East SEZ, 2008

Road	General Direction	Location	AADT (Vehicles)
I-10	East–West	West of junction State Route 62 North	81,000
		East of junction State Route 62 North	79,000
		West of junction State Route 86 South	52,000
		East of junction State Route 86 South	25,000
		West of Chiriaco Summit Interchange	22,500
		West of junction State Route 177 North	23,000
		East of junction State Route 177 North	21,400
		Corn Springs Road Interchange	21,400
		West of Wiley's Well Road	21,300
		East of Wiley's Well Road	23,500
		East of Mesa Drive	22,500
		East of junction State Route 78 South	23,800
		West of junction U.S. 95 North	25,000
		East of junction U.S. 95 North	25,500
State Route 62	East–West	Junction State Route 177	2,200
		Cadiz Road	2,000
		Blythe Rice Road	2,000
		Junction U.S. 95	2,700
State Route 78	North–South	Junction I-10	2,900
		South of 28th Avenue	1,800
		Fourth Street (Palo Verde)	2,650
State Route 177	North–South	Junction I-10	3,700
		Junction State Route 62	1,300
U.S. 95	North–South	Junction State Route 62	3,000
		South of Riverside/San Bernardino Co. Line	1,900
		North of Sixth Avenue (Blythe)	2,400
		North of Hobson Way (Blythe)	3,500

Source: Caltrans (2009).

Eight small airports, listed in Table 9.4.21.1-3, are open to the public and within a driving distance of approximately 72 mi (116 km) of the proposed Riverside East SEZ. None of these airports has regularly scheduled passenger service. The nearest public airports are the Blythe and Desert Center Airports, which are immediately adjacent to (Blythe) or within the bounds of (Desert Center) the general SEZ area.

9.4.21.2 Impacts

As discussed in Section 5.19, primary transportation impacts of the SEZ are anticipated to come from commuting worker traffic. I-10, a regional traffic corridor, would experience small impacts for single projects that may have up to 1,000 daily workers, with an additional 2,000 vehicle trips per day (maximum). Such an increase is less than 10% of the current traffic on I-10, as summarized in Table 9.4.21.1-2, which provides the available AADT values for routes in the vicinity of the SEZ. However, the exits on I-10 might experience moderate impacts with some congestion. Local road improvements would be necessary in any portion of the SEZ near I-10 that might be developed so as not to overwhelm the local roads near any site access point(s). Similarly, any access to portions of the SEZ using State Route 177 or U.S. 95 may require road improvements on State Route 177 or U.S. 95 and local access roads.

Solar development within the SEZ would affect public access along OHV routes designated open and available for public use. There are several routes designated as open within the proposed SEZ. Open routes crossing areas granted ROWs for solar facilities would be redesignated as closed (see Section 5.5.1 for more details on how routes coinciding with proposed solar facilities would be treated).

If up to three large projects with approximately 1,000 daily workers each were under development simultaneously, an additional 6,000 vehicle trips per day could be added to I-10 in the vicinity of the SEZ, assuming ride-sharing was not implemented and all access to the SEZs was funneled through I-10 (i.e., no workers commuted to work via State Route 177 from State Route 62 to the north or via local roads from U.S. 95 to the east). This would be an increase of about 25% of the current average daily traffic on most segments of I-10 near the SEZ, and could have moderate impacts on traffic flow during peak commute times. The extent of the problem would depend on the relative locations of the projects within the SEZ, where the worker populations originate, and work schedules. Affected exits on I-10 would experience moderate impacts with some congestion. Local road improvements would be necessary in any portion of the SEZ near I-10 that might be developed so as not to overwhelm the local roads near any site access point(s). Similarly, any access to portions of the SEZ that use State Route 177 or U.S. 95 may also require road improvements on State Route 177 or U.S. 95 and local access roads, depending on the percentage of worker commuter traffic using those routes.

TABLE 9.4.21.1-3 Airports Open to the Public in the Vicinity of the Proposed Riverside East SEZ

			Runway 1[a]			Runway 2[a]		
Airport	Location	Owner/Operator	Length (ft [m])	Type	Condition	Length (ft [m])	Type	Condition
Avi Suquilla	Just across the border in Parker, Arizona, approximately 62 mi (100 km) by way of U.S. 95 east of the SEZ	Colorado River Indian Tribes	6,250 (1,905)	Asphalt	Good	–[b]	–	–
Bermuda Dunes	54 mi (87 km) west of the SEZ off I-10	Bermuda Dunes Airport Corporation	5,002 (1,525)	Asphalt	Good	–	–	–
Blythe	Off I-10, at the eastern edge of the SEZ	County of Riverside/ City of Blythe	5,800 (1,768)	Asphalt	Good	6,543 (1,994)	Asphalt	Good
Chiriaco Summit	Off I-10, exit 173, 19 mi (31 km) west of the SEZ	County of Riverside	4,600 (1,402)	Asphalt	Fair	–	–	–
Desert Center	Off State Route 177 just north of I-10, surrounded by the SEZ	Chuckwalla Valley Associates	4,200 (1,280)	Asphalt	Fair	–	–	–
Jacqueline Cochran Regional	West of State Route 86 south of I-10 interchange, about 53 mi (85 km) from the SEZ to the west	County of Riverside	4,995 (1,522)	Asphalt	Good	8,500 (2,591)	Asphalt	Good
Palm Springs International	About 72 mi (116 km) to the west of the SEZ near I-10	City of Palm Springs	4,952 (1,509)	Asphalt	Good	10,001 (3,048)	Asphalt/ Porous Friction	Good

TABLE 9.4.21.1-3 (Cont.)

			Runway 1[a]			Runway 2[a]		
Airport	Location	Owner/Operator	Length (ft [m])	Type	Condition	Length (ft [m])	Type	Condition
Twentynine Palms	Approximately 55 mi (88 km) to the northwest of the SEZ along State Route 62	County of San Bernardino	3,797 (1,157)	Asphalt	Good	5,531 (1,686)	Asphalt	Good

[a] Source: FAA (2009).

[b] A dash indicates not applicable.

Because of the proximity of the Blythe and Desert Center Airports, there is a potential for impacts on or interference with flight paths and related flight operations, depending on the location of a solar project within the SEZ. Without proper planning, there could be problems with reflector glare interfering with pilot vision during takeoffs and landings. Problems with glare would be dependent on the specific locations of reflectors within the SEZ. Compliance with FAA regulations and implementation of required programmatic design features would address these concerns. For example, the location of power towers and other taller structures would take into account runway takeoff and landing patterns.

9.4.21.3 SEZ-Specific Design Features and Design Feature Effectiveness

The programmatic design features discussed in Appendix A, Section A.2.2, including local road improvements, multiple site access locations, staggered work schedules, and ride-sharing, would all provide some relief to traffic congestion on local roads leading to the SEZ. Depending on the locations of proposed solar facilities within the SEZ, more specific access locations and local road improvements could be implemented.

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9.4.22 Cumulative Impacts

The analysis presented in this section addresses the potential cumulative impacts in the vicinity of the proposed Riverside East SEZ in Riverside County, California. The CEQ guidelines for implementing NEPA define cumulative impacts as environmental impacts resulting from the incremental impacts of an action when added to other past, present, and reasonably foreseeable future actions (40 CFR 1508.7). The impacts of other actions are considered without regard to the agency (federal or nonfederal), organization, or person that undertakes them. The time frame of this cumulative impacts assessment could appropriately include activities that would occur up to 20 years in the future (the general time frame for PEIS analyses), but little or no information is available for projects that could occur further than 5 to 10 years in the future.

The nearest population center is the small community of Blythe located 6 mi (9 km) east of the SEZ. The small town of Desert Center is adjacent to the southwestern boundary of the SEZ. The proposed Riverside East SEZ is closely surrounded by Joshua Tree NP to the west and seven WAs: the Palen-McCoy WA, Rice Valley WA, and Big Maria Mountains WA are all located north of the SEZ; the Chuckwalla Mountains WA, Little Chuckwalla Mountains WA, and Palo Verde Mountain WA are all located south of the SEZ; and Joshua Tree WA is located to the west. In addition, the Riverside East SEZ is located close to the Iron Mountain SEZ, and in some areas, impacts from the two SEZs overlap.

The geographic extent of the cumulative impacts analysis for potentially affected resources near the Riverside East SEZ is identified in Section 9.4.22.1. An overview of ongoing and reasonably foreseeable future actions is presented in Section 9.4.22.2. General trends in population growth, energy demand, water availability, and climate change are discussed in Section 9.4.22.3. Cumulative impacts for each resource area are discussed in Section 9.4.22.4.

9.4.22.1 Geographic Extent of the Cumulative Impacts Analysis

The geographic extent of the cumulative impacts analysis for potentially affected resources evaluated near the Riverside East SEZ is provided in Table 9.4.22.1-1. These geographic areas define the boundaries encompassing potentially affected resources. Their extent varies on the basis of the nature of the resource being evaluated and the distance at which an impact may occur (thus, for example, the evaluation of air quality may have a greater regional extent of impact than visual resources). Most of the lands around the SEZ are administered by the BLM, the NPS, or the DoD; there are also some Tribal Lands about 10 mi (16 km) to the east and northeast of the SEZ. The BLM administers approximately 58% of the lands within a 50-mi (80-km) radius of the SEZ.

TABLE 9.4.22.1-1 Geographic Extent of the Cumulative Impacts Analysis by Resource Area: Proposed Riverside East SEZ

Resource Area	Geographic Extent
Land use	Eastern Riverside County
Specially Designated Areas and Lands with Wilderness Characteristics	Within a 25-mi (40-km) radius of the Riverside East SEZ
Rangeland Resources	Eastern San Bernardino and Riverside Counties
Recreation	All of San Bernardino and Riverside Counties
Military and Civilian Aviation	For Military Aviation, southeastern California and western Arizona For Civilian Aviation, eastern San Bernardino and Riverside Counties
Soil Resources	Areas within and adjacent to the Riverside East SEZ
Minerals	Eastern San Bernardino and Riverside Counties
Water Resources	
Surface Water	CRA, Colorado River, Palen Lake, Ford Dry Lake
Groundwater	Chuckwalla Valley and Palo Verde Mesa Basins
Air Quality and Climate	A 31-mi (50-km) radius from the center of the Riverside East SEZ within the Mojave Desert Air Basin
Vegetation, Wildlife and Aquatic Biota, Special Status Species	A 50-mi (80-km) radius from the center of the Riverside East SEZ, including portions of Riverside, San Bernardino, and Imperial Counties in California and La Paz and Yuma Counties in Arizona
Visual Resources	Viewshed within a 25-mi (40-km) radius of the Riverside East SEZ
Acoustic Environment (noise)	Areas adjacent to the Riverside East SEZ
Paleontological Resources	Areas within and adjacent to the Riverside East SEZ
Cultural Resources	Areas within and adjacent to the Riverside East SEZ for archaeological sites; viewshed within a 25-mi (40-km) radius of the Riverside East SEZ for other properties, such as traditional cultural properties
Native American Concerns	Valley areas and mountains within and adjacent to the Riverside East SEZ; viewshed within a 25-mi (40-km) radius of the Riverside East SEZ
Socioeconomics	A 50-mi (80-km) radius from the center of the Riverside East SEZ
Environmental Justice	A 50-mi (80-km) radius from the center of the Riverside East SEZ
Transportation	U.S. Highway 10; State Route 177; railroads running north-south, one on western and one on eastern portion of Riverside East SEZ.

9.4.22.2 Overview of Ongoing and Reasonably Foreseeable Future Actions

The future actions described below are those that are "reasonably foreseeable"; that is, they have already occurred, are ongoing, are funded for future implementation, or are included in firm near-term plans. Types of proposals with firm near-term plans are as follows:

- Proposals for which NEPA documents are in preparation or finalized;

- Proposals in a detailed design phase;

- Proposals listed in formal NOIs published in the *Federal Register* or state publications;

- Proposals for which enabling legislations has been passed; and

- Proposals that have been submitted to federal, state, or county regulators to begin a permitting process.

Projects in the bidding or research phase or that have been put on hold were not included in the cumulative impact analysis.

The ongoing and reasonably foreseeable future actions described below are grouped into two categories: (1) actions that relate to energy production and distribution, including potential solar energy projects under the proposed action (Section 9.4.22.2.1), and (2) other ongoing and reasonably foreseeable actions, including those related to mining and mineral processing, grazing management, transportation, recreation, water management, and conservation (Section 9.4.22.2.2). Together, these actions have the potential to affect human and environmental receptors within the geographic range of potential impacts over the next 20 years.

9.4.22.2.1 Energy Production and Distribution

Reasonably foreseeable future actions related to energy production and distribution and other major actions within a 50-mi (80-km) radius from the center of the Riverside East SEZ, which includes portions of Riverside, San Bernardino, and Imperial Counties in California, and La Paz and Yuma Counties in Arizona, are identified in Table 9.4.22.2-1 and described in the following sections. Future renewable energy facilities are expected to be the main contributors to potential future impacts in this area, because of favorable conditions in the area for their development, large acreages required, and potentially large quantities of water used. The area is otherwise largely undeveloped and would be expected to remain so in the absence of renewable energy development. Thus, this analysis focuses on renewable energy facilities and any other foreseeable energy large projects, nominally covering 500 acres or more or requiring amounts of water on the scale of utility-scale CSP.

TABLE 9.4.22.2-1 Reasonably Foreseeable Future Actions Related to Energy Development and Distribution and Other Major Actions near the Proposed Riverside East SEZ[a]

Description	Status	Resources Affected	Primary Impact Location
Renewable Energy Projects on Private or County Lands			
Rice Solar Energy, 150 MW power tower facility, 2,560 total acres (on private land)	In review; AFC filed with CEC Oct. 21, 2009; CEC comments on AFC sent Nov. 23, 2009.	Land use, visual, terrestrial habitats, wildlife, groundwater	About 15 mi (24 km) north of the eastern part of Riverside East SEZ, adjacent to and south of State Route 62
Tessera Solar, up to 500 MW dish engine facility (on county land)	County of Riverside awarded contract June 2009	Land use, visual, terrestrial habitats, wildlife, groundwater	Riverside County
Fast-Track Solar Energy Projects on BLM-Administered Land			
First Solar Desert Sunlight (CACA 48649), 550-MW PV facility; 4,410 disturbed acres	NOI to prepare an EIS issued on Jan. 13, 2010	Land use, visual, terrestrial habitats, wildlife, groundwater	Western part of Riverside East SEZ
Solar Millennium Palen Solar Project (CAC 48810), 484-MW solar trough; 5,200 total acres	NOI to prepare an EIS issued on Nov. 23, 2009	Land use, visual, terrestrial habitats, wildlife, groundwater	West-central part of Riverside East SEZ
Solar Millennium Blythe Solar Project (CACA 48811), 986-MW trough facility; 9,480 total acres[b]	NOI to prepare an EIS issued on Nov. 23, 2009	Land use, visual, terrestrial habitats, wildlife, groundwater	Eastern part of Riverside East SEZ
NextEra Genesis Ford Dry Lake Solar Project (CACA 48880), 250-MW trough facility; 4,640 total acres[b]	NOI to prepare an EIS issued on Nov. 23, 2009	Land use, visual, terrestrial habitats, wildlife, groundwater	Central part of Riverside East SEZ
Renewable Energy Projects			
Orresource Geothermal (CACA 6217, CACA 6218, CACA 17568)	Ongoing	Land use, terrestrial habitats, visual	About 50 mi (80 km) south of Riverside East SEZ, within the East Mesa Known Geothermal Resource Area
Geothermal Power Project (CACA 18092X)	Authorized	Land use, terrestrial habitats, visual	About 50 mi (80 km) south of Riverside East SEZ, within the East Mesa Known Geothermal Resource Area

TABLE 9.4.22.2-1 (Cont.)

Description	Status	Resources Affected	Primary Impact Location
Renewable Energy Projects (Cont.)			
Geothermal Power Project (CACA 29853X)	Authorized	Land use, terrestrial habitats, visual	About 45 mi (72 km) southwest of Riverside East SEZ
Transmission and Distribution			
Blythe Energy Project Transmission Line Modifications	Under way	Land use, terrestrial habitats, visual	Riverside County
Devers to Palo Verde No. 2	California portion authorized	Land use, terrestrial habitats, visual	Riverside County
Other Projects			
Cadiz Valley Dry Year Supply Project	Under review	Disturbed areas, terrestrial habitats along railroad ROW	Areas adjacent to ARZC Railroad ROW in southern portion of Iron Mountain SEZ, about 40 mi (64.3 km) north of Riverside East SEZ
Proposed West Chocolate Mountains Renewable Energy Evaluation Area	NOI to prepare an EIS issued on Feb. 10, 2010	Land use, visual, terrestrial habitats, wildlife, groundwater	About 20 mi (32 km) southwest of Riverside East SEZ
Eagle Crest Hydroelectric Plant	Draft license application submitted to FERC June 2009	Land use, surface water	Eagle Mountain Mine, near northwest portion of Riverside East SEZ
Grazing Lease Rice Valley Allotment	EA Issuance of 10-year Grazing Lease; Jan. 2007 (CA-660-EA06-55)	Land use, surface water	Riverside County

[a] Projects in later stages of agency environmental review and project development.

[b] Project approved. Updated information will be included in the Final EIS. See http://www.blm.gov/wo/st/en/prog/energy/renewable_energy/fast-track_renewable.html for details.

Renewable Energy Development

Several recent executive and legislative actions in California have addressed renewable energy development within the state. In November 2008, Governor Schwarzenegger signed E.O. S-14-08 to streamline California's renewable energy project approval process and increase the state's RPS to the most aggressive in the nation—at 33% renewable power by 2020. On September 15, 2009, the Governor issued a second E.O., now requiring that 33% of all electrical energy produced in the state be from renewable energy sources by the year 2020. The E.O. directed the CARB to adopt regulations increasing California's RPS to 33% by 2020.

In 2009, the California Legislature drafted bills requiring that electrical energy production meet a standard of 33% from renewable sources. On October 12, 2009, Governor Schwarzenegger vetoed two bills from the California Legislature on electrical energy generated by renewable sources in favor of an alternative plan that would remove limits on the amount of renewable power utilities could buy from other states (African American Environmentalist Association 2009).

Solar Energy. Table 9.4.22.2-1 lists one project on private land (Rice Solar Energy), one project on county land (Tessera Solar), and four foreseeable solar energy projects on public land, the so-called fast-track projects. Fast-track projects are those on public lands for which the environmental review and public participation process is under way and the applications could be approved by December 2010 (BLM 2010c). These projects are considered foreseeable because the permitting and environmental review processes are under way. The locations of the Rice and fast-track projects are shown on Figure 9.4.22.2-1. Other, more numerous, pending regular-track applications shown in the figure are discussed collectively at the end of this section.

- Rice Solar Energy. The proposed Rice Solar Energy Project would be a power tower facility with an output of 150 MW constructed on 1,410 acres (6 km^2) of a 2,560-acre (10-km^2) parcel on privately owned land in unincorporated eastern Riverside County, California (CEC 2009b). Access to the site would be from State Route 62 located just north of the site. The site is about 15 mi (24 km) north of the eastern portion of the Riverside East SEZ. Land surrounding the project site consists mostly of undeveloped open desert owned by the Federal Government and managed by the BLM.

  The facility would employ a liquid salt heat transfer and storage medium and a conventional steam turbine. Propane would be used for auxiliary heating, and no natural gas pipeline to the facility would be needed. The facility would use an air-cooled condenser (dry cooling). Water use during the proposed 2011 to 2013 (30-month) construction period would be 780 ac-ft/yr (0.96 million m^3/yr). Process water requirements for facility operations, commencing by the end of 2013, are estimated to be up to 180 ac-ft/yr (0.22 million m^3/yr), assuming an operating capacity factor of 37%. A mostly local construction workforce (averaging 280 workers) would be used. Operations and maintenance of the facility would employ an estimated 47 workers (CEC 2009b).

  Surveys found seven desert tortoises, along with shell-skeletal remains, burrows, egg shell fragments, and scat present on the project site, along the generator tie-line route, and within the 1-mi (1.6-km) wide zone surrounding the project site. In addition, Western burrowing owl, Mojave fringe-toed lizard, and loggerhead shrike were found to be present in or near the project

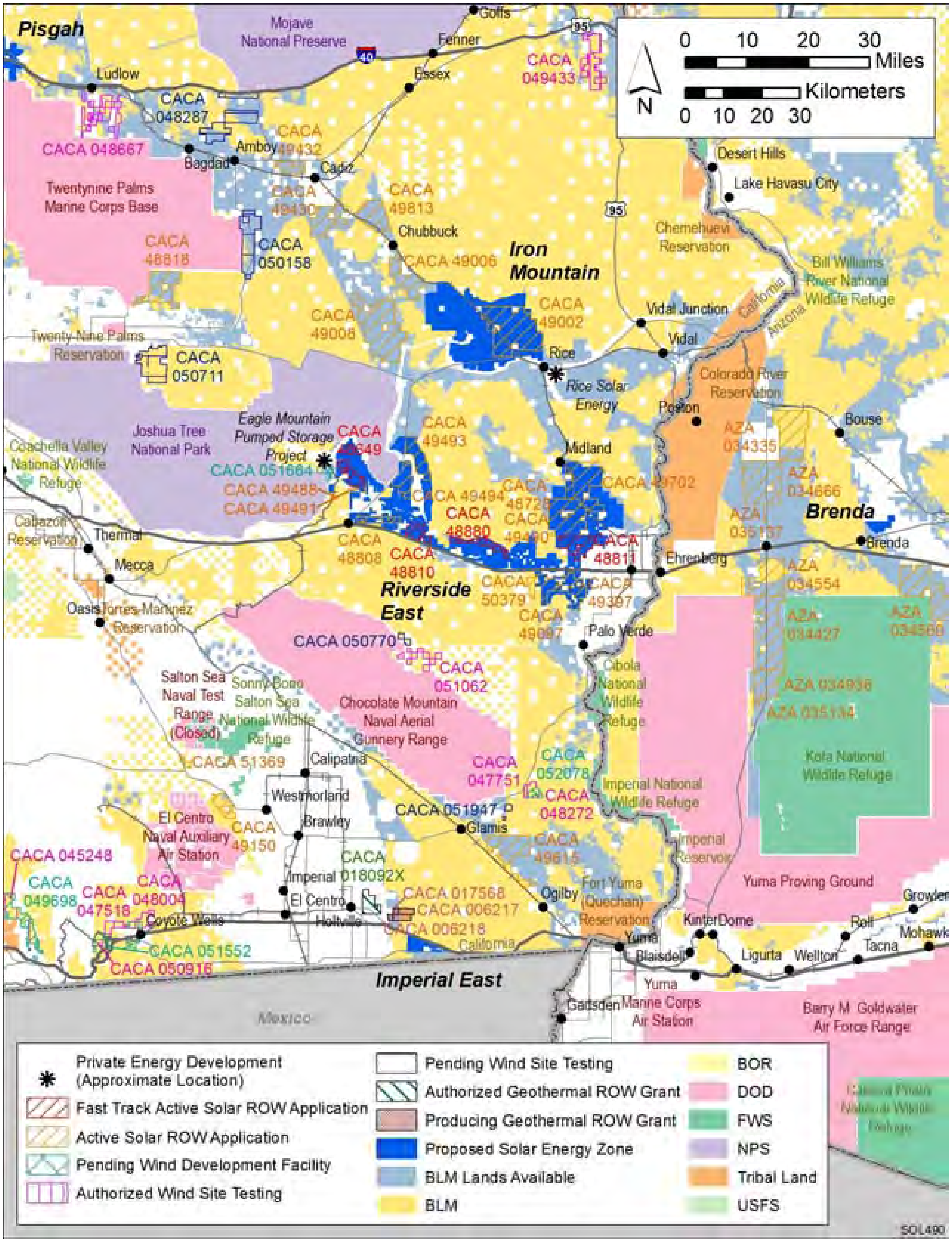

FIGURE 9.4.22.2-1 Location of Renewable Energy Proposals on Public Land within a 50-mi (80-km) Radius of the Proposed Riverside East SEZ

area. Several California-listed sensitive plant species were found on the project site or along the proposed transmission line ROW (CEC 2009a).

- *Tessera Solar on County of Riverside Land*. In June 2009, Tessera Solar was selected by the County of Riverside to develop solar energy projects on county-owned land at closed landfills and on undeveloped land adjacent to county airports (Electric Energy Online 2009).

  The solar projects would utilize the CSP dish engine (i.e., SunCatchers) technology and would develop as much as 500 MW of solar power on County of Riverside land. The company is currently analyzing the parcels of available land to determine the best location for the projects.

- *First Solar Desert Sunlight (CACA 48649).* This proposed fast-track project would use a thin-film PV technology in a facility with an output of 550 MW. The project site is located on approximately 9,480 acres (38.4 km^2) and would disturb up to 4,400 acres (17.8 km^2) of public land in Riverside County, California, approximately 6 mi (8 km) north of the community of Desert Center, California, and about 7 mi (11 km) north of the I-10 transmission corridor (BLM 2009e). The facility and most of the corridor for the project's 230-kV generation interconnection transmission line would be located in the western portion of the proposed Riverside East SEZ. The project would include the solar facility, an on-site substation, a 230-kV interconnection line , and a planned 230- to 500-kV Red Bluff Substation. The Red Bluff Substation would connect the project to the Southern California Edison (SCE) regional transmission grid.

  The proposed facility would have an estimated water requirement of 27 ac-ft/yr (33,000 m^3/yr) during its 2011 to 2013 construction period and only 4 ac-ft/yr (5,000 m^3/yr) thereafter for operation (BLM and CEC 2010a). On the basis of estimated employment levels for PV facilities (Section 9.4.19.2.2), construction of the facility would employ about 220 people, while operations would require an estimated 11 full-time employees.

- *Solar Millennium Palen Solar Project (CACA 48810).* This proposed fast-track project is a parabolic trough facility with an output of 484 MW. The project site would be on public land within the western portion of the proposed Riverside East SEZ, approximately 10 mi (16 km) east of Desert Center, California, adjacent to the I-10 transmission corridor. The proposed facility would occupy approximately 3,800 acres (15.4 km^2) within a proposed 5,200-acre (20.9-km^2) ROW. The facility would employ two adjacent and independent solar troughs with nominal output of 250 MW each. It would employ dry cooling and would require about 300 ac-ft/yr (0.37 million m^3/yr) of groundwater drawn from two on-site wells for mirror washing and other uses. Water requirements during the proposed construction period of 2011 to 2013 are estimated to be 480 ac-ft/yr (0.59 million m^3/yr). The project would disturb about 3,000 acres (12 km^2). The facility would connect to the planned Red Bluff substation, to be built approximately 10 mi (16 km) west of the project location. An auxiliary boiler would be fired with propane. An average of 566 workers would be employed during construction, and 134 full-time employees would be required for operations (BLM and CEC 2010a).

Special status species of concern include desert tortoise and Western burrowing owl. No desert tortoises and only low-quality tortoise habitat were observed during spring 2009 surveys. Cultural surveys have identified both prehistoric and historic cultural resources (BLM and CEC 2010a).

- *Solar Millennium Blythe Solar Project (CACA 48811).* This proposed fast-track project would be a parabolic trough facility with an output of 986 MW. The project site would be on public land within the eastern portion of proposed Riverside East SEZ, approximately 8 mi (13 km) west of Blythe, California, adjacent to the I-10 transmission corridor. The proposed facility would occupy approximately 9,480 acres (38.4 km^2) and disturb about 7,030 acres (28.5 km^2). The facility would employ four adjacent and independent solar troughs with nominal output of 250 MW each. It would employ dry cooling and would require about 600 ac-ft/yr (0.74 million m^3/yr) of groundwater drawn from two on-site wells for mirror washing and other uses. Water requirements during the proposed 2011 to 2015 construction period are estimated to be 620 ac-ft/yr (0.77 million m^3/yr). The facility would connect to a planned new substation, the Colorado River Substation, to be built approximately 5 mi (8 km) to the southwest of the project location. To supply auxiliary boilers, a 10-mi (16-km) long natural gas pipeline would be built to connect to an existing pipeline south of I-10; about 8 mi (13 km) of the line would be on the project ROW. An average of 604 workers would be employed during construction of the facility and 221 full-time employees would be required for operations (BLM and CEC 2010b).

  Project construction would result in a direct loss of low- to moderate-quality habitat for desert tortoise over the project site and would fragment and degrade adjacent native plant and wildlife communities. The project could also promote the spread of invasive non-native plants and desert tortoise predators such as ravens. Five species of California-listed sensitive plant species are present. Habitat is also present for Western burrowing owl, loggerhead shrike, Le Conte's thrasher, black-tailed gnatcatcher, and California horned lark (BLM and CEC 2010b).

- *NextEra Genesis Ford Dry Lake Solar Project (CACA-4880).* This proposed fast-track project consists of two independent solar trough facilities using wet cooling with a total output of 250 MW. The project site would be located on public land within the central portion of the proposed Riverside East SEZ, approximately 20 mi (32 km) west of Blythe, California, north of I-10 and near Dry Lake, California. The proposed facility would occupy 4,640 acres (18.8 km^2) and directly affect 1,800 acres (7.3 km^2). The proposed facility would employ wet cooling and would require about 1,640 ac-ft/yr (2.0 million m^3/yr) of cooling water that would be obtained from on-site wells. Water requirements during the proposed construction period of 2011 to 2013 are estimated to be 870 ac-ft/yr (1.1 million m^3/yr). The facility would interconnect to the proposed Colorado River Substation via a 230-kV on-site switchyard and a new transmission line that would tie into the existing Blythe Energy Project transmission line. The new transmission line, natural gas line, and access road would be built in the same corridor that would exit the southern site boundary and extend about 7 mi (11 km) to the south. An average of 646 workers would be employed during construction of the facility and 40 to 50 full-time employees would be required for operations (BLM and CEC 2010c).

Biological surveys have identified a number of special status species, including Mojave and Colorado fringe-toed lizards, loggerhead shrike, Western burrowing owl, short-eared owl, prairie falcon, and northern harrier. While no live desert tortoise were found, burrows and bones were present on the site, and tracks and carcasses in the surrounding area. As many as 15 cultural resource sites would be directly affected by construction of the proposed Genesis Solar Energy Project (BLM and CEC 2010c).

- *Pending Solar ROW Applications on BLM-Administered Lands.* In addition to the four fast-track solar projects described above, a number of regular-track ROW applications for solar projects have been submitted to the BLM that would be located either within the Riverside East SEZ or within 50 mi (80 km) of the SEZ (BLM 2010b). Table 9.4.22.2-2 provides a list of all solar projects that had pending applications submitted to BLM as of March 2010. Figure 9.4.22.2-1 shows the locations of these applications.

  Within 50 mi (80 km) of the proposed Riverside East SEZ, there are 29 active solar applications. Within the boundaries of the Riverside East SEZ, there are 11 pending regular-track applications; they are administered through the Palm Springs-Southcoast Field Office.

  The likelihood of any of the regular-track ROW application projects actually being developed is uncertain but is generally assumed to be less than that for fast-track applications. The projects are all listed in Table 9.4.22.2-2 for completeness and as an indication of the level of interest in development of solar energy in the region. Some number of these applications would be expected to result in actual projects. Thus, the cumulative impacts of these potential projects are analyzed in their aggregate effects.

Wind Energy. Table 9.4.22.2-2 lists ROW grant applications for four pending authorization of wind testing, three authorized for wind site testing, and two wind development facilities within a 50-mi (80-km) radius of the proposed Riverside East SEZ. The actual development of all nine proposals is considered pending, however, since they await authorization of development of wind facilities. As shown in Figure 9.4.22.2-1, the locations of the applications lie generally northwest to southwest and within 30 mi (48 km) of the SEZ.

The likelihood of any of the regular-track wind projects actually being developed is uncertain; the projects are listed to give an indication of the level of interest in development of wind energy in the region. Most are in the wind testing stage, and Environmental Assessments necessary for project approval are being prepared.

Geothermal Energy. Imperial County is immediately south of the Riverside East SEZ and contains some of the most productive geothermal resource areas in the United States. Within the El Centro Field Office management area, 118,720 acres (480 km^2) is identified as having geothermal resource potential (BLM 2008b). This acreage is divided into seven KGRAs: Dunes, East Brawley, East Mesa, Glamis, Heber, Salton Sea, and South Brawley.

There are three producing and two authorized geothermal leases within a 50-mi (80-km) radius of the proposed Riverside East SEZ, as listed in Table 9.4.22.2-1 and shown in Figure 9.4.22.2-1. All of these leases are within Imperial County. The producing geothermal leases are about 50 mi (80 km) south of the SEZ and within the East Mesa KGRA. The producing leases CACA 6217, CACA 6218, and CACA 17568 are all owned by Orresource Geothermal. Of the authorized geothermal leases, CACA 29853X is located about 45 mi (72 km) southwest of the Riverside East SEZ and CACA 18092X is located about 50 mi (80 km) south.

Transmission and Distribution

Blythe Energy Project Transmission Line Modifications. Blythe Energy LLC is proposing transmission line modifications that would allow electrical output from Blythe Energy Project, a 520-MW natural gas-fired electric generating facility, to be delivered to the southern California International Standards Organization-controlled electrical transmission system. There are two components to the proposed BEP transmission line modifications:

- Buck to Julian Hinds transmission line component:

  - Upgrades to the Buck Substation.

    Installation of approximately 67 mi (108 km) of new 230-kV transmission line between the Buck Substation located adjacent to the Blythe Energy Project and the Julian Hinds Substation located approximately 60 mi (97 km) to the west.

TABLE 9.4.22.2-2 Pending Renewable Energy Project Applications on BLM-Administered Land within 50 mi of the Riverside East SEZ[a]

Serial No.	Project Name	Application Received	Size (acres[b])	MW	Technology	Field Office
Solar Applications						
AZA 034335	Boulevand Associates, LLC	June 8, 2007	24,221	500	CSP/Trough	Lake Havasu: Yuma
AZA 034427	Pacific Solar Invst., Inc. (Iberdrola)	Sept. 6, 2007	32,000	2,000	CSP/Trough	Yuma
AZA 034554	Nextlight Renewable Power, LLC	March 26, 2008	20,699	500	CSP/Trough	Yuma
AZA 034560	Nextlight Renewable Power, LLC	March 26, 2008	15,040	500	CSP/Trough	Yuma
AZA 034666	SolarReserve, LLC (Quartzsite)	May 27, 2008	25,204	100	CSP/Tower	Yuma
AZA 034936	Wildcat Quartzsite, LLC	Jan. 29, 2009	11,960	800	CSP/Tower	Yuma
AZA 035134	E-on Climate & Renewables (La Posa)	July 2, 2009	1,780	NA	NA	Yuma
AZA 035137	E-on Climate & Renewables (Castle Dome)	July 2, 2009	590	100	PV	Yuma
CACA 48728	FPL Energy	Jan. 31, 2007	20,608	250	CSP	Palm Springs-Southcoast
CACA 48808	Chuckwalla Solar, LLC	Sept. 15, 2006	4,099	200	PV	Palm Springs-Southcoast
CACA 48818	First Solar (Desert Opal)	Feb. 26, 2007	15,824	1,205	PV	Barstow
CACA 49002	Leopold Company, LLC	Apr. 2, 2007	35,466	4,100	CSP	Needles
CACA 49006	Boulevard Associates, LLC	May 14, 2007	12,046	1,000	CSP	Needles
CACA 49008	Boulevard Associates, LLC	May 14, 2007	35,639	1,000	CSP	Needles
CACA 49097	Bull Frog Green Energy, LLC	Oct. 1, 2008	6,634	2,500	PV	Palm Springs-Southcoast
CACA 49150	BCL & Associate, Inc.	July 17, 2007	5,464	500	PV	El Centro
CACA 49397	First Solar (Desert Quartzite)	Sept. 28, 2007	7,548	600	PV	Palm Springs-Southcoast
CACA 49430	Iberdrola Renewables, Inc.	Dec. 8, 2008	13,373	N/A	CSP	Needles
CACA 49432	PG&E	Sept. 24, 2007	5,315	800	Undecided	Needles
CACA 49488	EnXco, Inc.	Nov. 13, 2007	1,327	300	CSP	Palm Springs-Southcoast
CACA 49490	EnXco, Inc.	Nov. 13, 2007	20,608	300	CSP	Palm Springs-Southcoast
CACA 49491	EnXco, Inc.	Nov. 13, /2007	1,327	300	CSP	Palm Springs-Southcoast
CACA 49493	Solel, Inc.	March 27, 2008	8,750	500	CSP	Palm Springs-Southcoast
CACA 49494	Solel, Inc.	Nov. 6, 2007	7,317	500	CSP	Palm Springs-Southcoast
CACA 49615	Pacific Solar Investments, Inc.	Sept. 4, 2007	17,807	1,500	PV	El Centro
CACA 49702	Bull Frog Green Energy, LLC	June 1, 2008	22,717	2,500	PV	Palm Springs-Southcoast
CACA 49813	Iberdrola Renewables, Inc.	April 1, 2008	12,833	1,000	CSP	Needles
CACA 50379	Lightsource Renewables, LLC	Aug. 8, 2008	2,446	550	CSP	Palm Springs-Southcoast
CACA 51369	Invenergy Solar Development, LLC	Sept. 16, 2009	1,081	50	PV	El Centro

TABLE 9.4.22.2-2 (Cont.)

Serial No.	Project Name	Application Received	Size (acres[b])	MW	Technology	Field Office
Wind Applications						
Pending Wind Site Testing						
CACA 50158	Little Mountain Wind Power, LLC	May 12, 2008	15,000	–[c]	Wind	Needles
CACA 50711	Padoma Wind Power	March 17, 2009	23,829	–	Wind	Barstow
CACA 50770	–	–	–	–	Wind	–
CACA 51947	L.H. Renewables, LLC	March 10, 2010 Application Authorized	9,069	–	Wind	El Centro
Authorized Wind Site Testing						
CACA 47751	Renewergy, LLC	Jan. 23, 2007	11,187	–	Wind	El Centro
CACA 48272	Imperial Wind	Aug. 16, 2010	1,960	–	Wind	El Centro
CACA 51062	John Deere Renewables, LLC	April 29, 2009	6,256	–	Wind	El Centro
Pending Wind Developoment Facility						
CACA 51664	L.H. Renewables, LLC	Dec. 8, 2009	3,500	–	Wind	Palm Springs
CACA 52078	Imperial Wind	May 28, 2010	2,054	65	Wind	El Centro

[a] Information taken from pending and authorized wind energy projects listed on BLM California Desert District Web site (BLM 2010h) and downloaded from GeoCommunicator (BLM and USFS 2010b); total solar acres = 389,723 total solar MW = 24,137; total wind acres and MW not available.

[b] To convert acres to km^2, multiply by 0.004047.

[c] A dash indicates data not available.

  - The proposed transmission line route would generally follow SCE‘s existing 500-kV Devers-Palo Verde transmission line.

  - Transmission line structures would be concrete, single-pole structures.

  - Upgrades to the Julian Hinds Substation.

- Buck to Devers-Palo Verde transmission line component:

  - Upgrades to Buck Substation.

  - Installation of approximately 7 mi (11 km) of a new 230-kV transmission line (initially operated at 161 kV) between the Buck Substation and SCE’s existing Devers-Palo Verde 500-kV transmission line.

  - Transmission line structures would be concrete single-pole structures.

  - Construction of a new 161-kV to 500-kV substation at the point of interconnection with SCE’s existing Devers-Palo Verde 500-kV transmission line (CEC 2010a).

The CEC Web site indicates that Blythe Energy is currently making the transmission line and substation modifications and expects construction to be completed in 2010 (CEC 2010a).

Devers to Palo Verde No.2. A second Devers-Palo Verde line has been proposed that will run adjacent to the existing line south of I-10 and the proposed Riverside East SEZ in an existing corridor. The 500-kV line would run 230 mi (370 km) following the existing Devers-Palo Verde 500-kV line from San Bernardino in California to the Harquahala Generating Station near the Palo Verde Nuclear Plant in Arizona. However, the Arizona Corporation Commission has denied the Arizona portion of the line. In California, the line would run a total of 153 mi (245 km) from the Colorado River Substation to the Devers Substation and end at Valley Substation. The CPUC approved the California portion of the line on Nov. 20, 2009 (CPUC 2009). Southern California Edison is expecting to begin construction of the California portion of the line in 2011 and have the line in service in 2013. Construction is pending ISO satisfaction with conditions for interconnection agreements, while the project still requires approval in a BLM ROD.

9.4.22.2.2 Other Actions

Other Foreseeable Actions

Cadiz Valley Dry-Year Supply Project. The Cadiz Valley Dry-Year Supply Project is a water storage and supply program that will provide southern California with as much as

150,000 ac-ft/yr (185 million m^3/yr) of water during years of droughts, emergencies, or other periods of urgent need by utilizing the aquifer system that underlies Cadiz's 35,000 acres (142 km^2) of land holdings in the Cadiz and Fenner Valleys of eastern San Bernardino County (Cadiz, Inc. 2008), about 40 mi (64 km) north of the western portion of the Riverside East SEZ. Historically, such dry periods occur in about 3 out of every 10 years. In any given dry year, this water would be enough to serve more than 1.2 million people. The project would involve taking water from the CRA during high rainfall years and storing it in aquifer systems to supply southern California's water needs during periods of severe drought (Cadiz Inc. 2008).

The project was the subject of congressional hearings in August 2009 regarding Cadiz, Inc.'s controversial proposal to use a 42-mi (68-km) long stretch of a Mojave railway line ROW for the water pipeline (Chance of Rain 2009). A portion of the water pipeline would cross the extreme southern part of the Iron Mountain SEZ, about 20 mi (32 km) north of the Riverside East SEZ.

Proposed West Chocolate Mountains Renewable Energy Evaluation Area. In a February 10, 2010, NOI in the *Federal Register*, the BLM El Centro Field Office announced its intent to prepare an EIS to consider an amendment to the California Desert Conservation Area Plan to identify whether 21,300 acres (86.2 km^2) of BLM-administered lands within the West Chocolate Mountains area should be made available for geothermal, solar, or wind energy development (BLM 2010a). The Evaluation Area lies about 20 mi (32 km) southwest of the proposed Riverside East SEZ in Riverside County, east of Niland and northeast of El Centro, California.

Eagle Crest Hydroelectric Plant. Eagle Crest Energy company proposes to construct and operate a 1,300-MW pumped storage hydroelectric plant at the Eagle Mountain Mine located near the northwest portion of the Riverside East SEZ about 10 mi (16 km) north of Desert Center. A draft license application for project approval was submitted to the FERC in June 2008 (Eagle Crest Energy 2008a). In September 2008, Eagle Crest Energy submitted a request to the California Water Resources Control Board for water qualification certification pursuant to Section 401 of the CWA (Eagle Crest Energy 2008b).

The pumped storage facility would be constructed at the old Eagle Mountain Mine site. The facility would use former mine pits (i.e., upper and lower reservoirs), which would be linked by subsurface tunnels to convey water through four reversible 325-MW turbines. Water would be pumped alternately to the upper storage reservoirs and released to the lower reservoirs. The lower reservoirs would initially be filled with 25,000 ac-ft (30.8 million m^3) of water. The system is estimated to lose some water to seepage and evaporation and require makeup water estimated at 2,400 ac-ft/yr (3.0 million m^3/yr).

Eagle Crest Energy would build transmission lines to convey power to a new substation that would in turn connect to the 500-kV Palo Verde-Devers transmission line located about 10 mi (16 km) from the project site (Eagle Crest Energy 2009).

Other Ongoing Actions

Mining. Several mining claims are active north of the eastern portion of the Riverside East SEZ. The BLM GeoCommunicator Database showed mining densities of 26 to 50 per section within the five townships in the northern portions of the eastern part of the SEZ. Two townships along the southern portion of the eastern part adjacent to I-10 have mine claim densities of 51 to 100 in each township. Mine claim densities in townships in the western part of the SEZ vary from 1 to 10 in the two townships located northwest of State Route 177. The locations of individual mine claims and their potential conflict with solar energy projects will require additional analysis by solar energy companies and by decision-makers prior to project approval. Developers may have to purchase mine claims in order to site solar energy facilities.

Grazing

- *Ten-Year Grazing Lease Rice Valley Allotment*. The BLM prepared an EA on a proposal for a 10-year lease on the Rice Valley Allotment to authorize sheep grazing on 74,740 acres (302 km^2) of public land located approximately 26 mi (42 km) northwest of Blythe in Riverside County (BLM 2007a).

9.4.22.3 General Trends

9.4.22.3.1 Population Growth

Table 9.4.22.3-1 presents recent and projected populations in the 50-mi (80-km) radius ROI (i.e., the ROI is Riverside County) and in California as a whole. Population in the ROI stood at 2,103,050 in 2008, having grown at an average annual rate of 3.8% since 2000. The growth rate for the ROI was higher than that for California (1.4%) over the same period.

The ROI population is expected to increase to 2,965,113 by 2021 and to 3,085,643 by 2023 (California Department of Finance 2010).

9.4.22.3.2 Energy Demand

The growth in energy demand is related to population growth through increases in housing, commercial floorspace, transportation, manufacturing, and services. With population growth expected in Imperial, Riverside, and San Bernardino Counties between 2006 and 2016, an increase in energy demand is also expected. However, the EIA projects a decline in per-capita energy use through 2030, mainly because of improvements in energy efficiency and the high cost of oil throughout the projection period. Primary energy consumption in the United States between 2007 and 2030 is expected to grow by about 0.5% each year; the fastest growth is projected for the RCI sector, which is expected to grow by about 0.5% (residential), 0.4% (commercial), and 0.1% (industrial) each year (EIA 2009).

TABLE 9.4.22.3-1 ROI Population for the Proposed Riverside East SEZ

Location	2000	2008[a]	Average Annual Growth Rate, 2000–2008 (%)	2021	2023
Riverside County	1,559,039	2,103,050	3.8	2,965,113	3,085,643
California	34,105,437	38,129,628	1.4	44,646,420	45,667,413

[a] Data are averages for the period 2006 to 2008.

Sources: U.S. Bureau of the Census (2009f); California Department of Finance (2010).

9.4.22.3.3 Water Availability

The Riverside East SEZ is located within the Mojave Desert, which is characterized by extreme daily temperature ranges with low precipitation and humidity (CDWR 2009); annual precipitation is between 4 and 6 in./yr (10 and 15 cm/yr) (CDWR 2003).

Palen Lake and Ford Dry Lake are located in the SEZ. Palen Lake is a wet playa having groundwater located near the surface and covering an area of 4,260 acres (17 km^2) with only 750 acres (3 km^2) within the boundaries of the SEZ. Ford Dry Lake is a dry lakebed covering 4,400 acres (18 km^2), most of which is within the SEZ boundaries. The primary surface water features within the proposed Riverside East SEZ are several ephemeral drainages coming off the surrounding mountains.

The SEZ is located within two groundwater basins: Chuckwalla Valley and Palo Verde Mesa. There are no restrictive structures between the two groundwater basins. The total thickness of the principal aquifer is on the order of 1,200 ft (366 m) (CDWR 2003), and the alluvium layer thickness is on the order of 100 to 150 ft (30 to 46 m) in the region of the SEZ (Metzger et al. 1973).

Groundwater recharge in the Chuckwalla Valley is by subsurface underflow and from direct infiltration of precipitation runoff. Estimates of natural recharge have not been quantified in the Chuckwalla Valley. Natural recharge is estimated to be 800 ac-ft/yr (987,000 m^3/yr) in the neighboring Palo Verde Mesa and the Cadiz Valley, which have similar climate and precipitation conditions (CDWR 2003). Recharge from precipitation runoff is not suspected to be significant given the limited precipitation in the region (Metzger et al. 1973).

Groundwater discharge in the Chuckwalla Valley is primarily by evapotranspiration at Palen Lake and subsurface underflow to the Palo Verde Mesa; the evapotranspiration rate at Palen Lake is unknown, and the subsurface underflow is estimated to be 400 ac-ft/yr (493,000 m^3/yr) to Palo Verde Mesa (CDWR 2003).

Groundwater withdrawal rates were 9,100 ac-ft/yr (11.2 million m^3/yr) in 1966 (CDWR 2003), and between 4,400 and 5,700 ac-ft/yr (5.4 million and 7.0 million m^3/yr) during dry and wet years occurring in the period 1998 to 2001 (CDWR 2005). The majority of groundwater withdrawals in the region of the proposed SEZ are for agricultural and domestic uses.

Groundwater surface elevations are routinely monitored in the Chuckwalla Valley and Palo Verde Mesa. Depth to groundwater ranges between 80 and 270 ft (24 and 82 m) below the surface across the Chuckwalla Valley and into the Palo Verde Mesa (USGS 2010b). Groundwater surface elevations have remained steady for several decades (USGS 2010c, monitoring wells 334438115211101, 333939114411501).

Groundwater well yields average 1,800 gpm (6,814 L/min) with a maximum of 3,900 gpm (14,760 L/min) in the Chuckwalla Valley. However, the majority of the groundwater extractions are clustered on the western and eastern edges of the valley around Desert Center and the Palo Verde Mesa. It is suspected that further groundwater development in this region may lead to declines in groundwater elevations (Metzger et al. 1973; Steinemann 1989).

In 2005, water withdrawals from surface waters and groundwater in Riverside County were 1.4 million ac-ft/yr (1.7 billion m^3/yr), of which 74% came from surface waters and 26% from groundwater. The largest water use category was municipal and domestic supply, at 519,000 ac-ft/yr (640 million m^3/yr). However, the majority of this water is used in the larger cities located in the western portion of Riverside County. Agricultural water uses accounted for 874,000 ac-ft/yr (1.1 billion m^3/yr), and industrial water uses on the order of 7,000 ac-ft/yr (8.6 million m^3/yr) (Kenny et al. 2009). The primary water use in the eastern portion of Riverside County relevant to the proposed Riverside East SEZ is for agriculture, representing 59 to 77% of total groundwater withdrawals during the dry and wet years, respectively, in the period 1998 to 2001 (CDWR 2005).

9.4.22.3.4 Climate Change

Global warming continues to affect many desert areas in the southwestern United States with increased temperature and prolonged drought during the past 20 to 30 years. A report on global climate change in the United States prepared on behalf of the National Science and Technology Council by the U. S. Global Research Program documents current temperature and precipitation conditions and historic trends, and projects impacts during the remainder of the twenty-first century through modeling using low and high scenarios of GHG emissions. The report summarizes the science of climate change and the recent and future impacts of climate change on the United States (GCRP 2009). The following excerpts from this report indicate that there has been a trend for increasing global temperature and decrease in annual precipitation in desert regions:

- Average temperature in the United States increased more than 2° F (1.1°C) over the period 1957 to 2007.

- Southern areas, particularly desert regions of southern Arizona and southeastern California, have experienced longer drought and are projected to have more severe periods of drought during the remainder of the twenty-first century. Much of the Southwest has experienced drought conditions since 1999. This period represents the most severe drought in 110 years.

- The incidence of wildfires in the western United States has increased in recent decades, partly because of increased drought.

- Temperature increases in the next 20 to 30 years are expected to be strongly correlated with past emissions of heat-trapping gases, such as carbon dioxide and methane.

- Many extreme weather events have increased both in frequency and intensity during the last 40 to 50 years. Precipitation and runoff are expected to decrease in the Southwest in spring and summer based on current data and anticipated temperature increases. Water use will increase over the next several decades as the population of southern California grows, resulting in trade-offs between competing uses.

- Climate project models also show a 10 to 20% decline in runoff in California and Nevada for the period of 2041 to 2060 compared with data from 1901 to 1970 used as a baseline.

- In the Southwest average temperatures increased about 1.5°F (0.8°C) in 2000 compared to a baseline period of 1960 to 1979. By the year 2020, temperatures are projected to rise 2 to 3°F (1.1 to 1.7°C) above the 1960 to 1979 baseline.

Increased global temperatures from GHG emissions will likely continue to exacerbate drought in the southern California deserts. The State of California has prepared several reports of climate change impact predictions through the remainder of the twenty-first century that address topics such as economics, ecosystems, water use/availability, impacts on Santa Ana winds, agriculture, timber production, and snowpack. The California climate change portal Web site (http://www.climatechange.ca.gov/publications/cat/index.html) lists the Climate Action Team reports that are submitted to the Governor and state legislature. These reports are included as final papers of the California Energy Commission's Public Interest Energy Research Program.

9.4.22.4 Cumulative Impacts on Resources

This section addresses potential cumulative impacts in the proposed Riverside East SEZ on the basis of the following assumptions: (1) because of the relatively large size of the proposed SEZ (more than 30,000 acres [121 km^2]), as many as three projects could be constructed at a time, and (2) maximum total disturbance over 20 years would be 162,317 acres (657 km^2) (80% of the entire proposed SEZ). For analysis, it is also assumed that no more than 3,000 acres

(12.1 km^2) would be disturbed per project annually and 250 acres (1.01 km^2) monthly on the basis of construction schedules planned in current applications. An existing 500-kV transmission line runs east–west along I-10 and parallel to the southern SEZ boundary and a 230-kV line passes through the far western section of the SEZ; therefore, for this analysis, the impacts of construction and operation of new transmission lines outside of the SEZ were not assessed. Regarding site access, because I-10 passes along the southern edge of the SEZ and there are several exits from I-10 as it passes by and through the SEZ, no major road construction activities outside of the SEZ would be needed for development to occur in the SEZ.

Cumulative impacts in each resource area that would result from the construction, operation, and decommissioning of solar energy development projects within the proposed SEZ when added to other past, present, and reasonably foreseeable future actions described in the previous section are discussed below. At this stage of development, because of the uncertainties of the future projects in terms of location within the proposed SEZ, size, number, and the types of technology that would be employed, the impacts are discussed qualitatively or semi-quantitatively, with ranges given as appropriate. More detailed analyses of cumulative impacts would be performed in the environmental reviews for the specific projects in relation to all other existing and proposed projects in the geographic areas.

9.4.22.4.1 Lands and Realty

Although the proposed Riverside East SEZ lies adjacent to the highly developed I-10 corridor, which includes a number of major transmission lines, roads, pipelines, and other infrastructure, much of the land within the proposed SEZ exhibits a rural character (Section 9.4.2.1). The SEZ contains only BLM-administered land, but numerous parcels of private land are scattered throughout the SEZ or are located in near proximity. One section of state land is surrounded by the SEZ.

Development of the SEZ would introduce a highly contrasting industrialized land use into an area that is largely rural. In addition, numerous other renewable energy projects are proposed within a 50-mi (80-km) radius of the Riverside East SEZ. As shown in Table 9.4.22.2-2 and Figure 9.4.22.2-2, as many as 33 solar projects and 9 wind projects have pending applications within this distance, with ROW applications for solar projects alone totaling more than 400,000 acres (1,600 km^2), including more than 30,000 acres (120 km^2) for six advanced solar proposals on private and public land (Section 9.4.22.2.1). As a result of the potential and likely development of other renewable energy projects and accompanying transmission lines, roads, and other infrastructure within the geographic extent of effects, the character of a large portion of the California Desert could be dramatically changed. The contribution to cumulative impacts of utility-scale solar projects on public lands on and around the Riverside East SEZ could be significant, particularly if the SEZ is fully developed with solar projects. Development of the public lands for solar energy production may also result in similar development on the state and private lands in the immediate vicinity of the SEZ.

Construction of utility-scale solar energy facilities within the SEZ would preclude use of those areas occupied by the solar energy facilities for other purposes. The areas that would be occupied by the solar facilities would be fenced, and access to those areas by both the general public and wildlife would be eliminated.

9.4.22.4.2 Specially Designated Areas and Lands with Wilderness Characteristics

The proposed Riverside East SEZ is located in the CDCA and surrounded by specially designated areas, including Joshua Tree NP, seven designated Wilderness Areas, and seven ACECs: Corn Springs, Alligator Rock, Chuckwalla DWMA, Chuckwalla Valley Dune Thicket, Desert Lily Preserve, Mule Mountains, and Palen Dry Lake (Section 9.4.3.1). Construction of utility-scale solar energy facilities within the SEZ in combination with potential development of other renewable energy projects and associated infrastructure would have the potential for contributing to the adverse visual impacts on these specially designated areas. Development of the SEZ, especially full development, would be a dominant factor in the viewshed from large portions of one or more of these areas.

Solar development both of the Riverside East SEZ and the Iron Mountain SEZ (which is about 25 mi [40 km] north), together with the Rice Solar Energy and Tessera Solar facilities on private land, would combine to adversely affect wilderness values in the Palen-McCoy, Rice Valley, Big Maria Mountains, Chuckwalla Mountains, and Little Chuckwalla Mountains WAs and in Joshua Tree NP. As of February 2010, 15 solar project applications were pending in the SEZ, including four fast-track solar applications, covering about 65% of the SEZ that, in combination with projects within a 50-mi (80-km) radius, likely will result in cumulative effects, particularly visual impacts, on sensitive areas.

9.4.22.4.3 Rangeland Resources

No livestock grazing now occurs in the SEZ; therefore, solar development of the area would not contribute to any cumulative effects on livestock grazing. Likewise, since SEZ is not located within either an HA or HMA, there would be no contribution to any adverse effects on wild horses or burros.

9.4.22.4.4 Recreation

The Riverside East SEZ is quite flat, but it does offer diverse recreational opportunities, especially during cooler months. Those opportunities include back country driving, camping, rockhounding, hunting, and seasonal nature hikes. The area has been traditionally used by the residents of Desert Center, Blythe, and urban areas to the west. It is anticipated there would not be a significant loss of recreational use caused by development of the Riverside East SEZ, although some users would be displaced.

When SEZ development is considered in combination with other potential renewable energy development within the region, a potential would exist for cumulative visual impacts on recreational users of the specially designated areas surrounding the SEZ (Section 9.4.22.4.2).

There is substantial potential for loss of wilderness and scenic values throughout the California Desert wherever solar and wind energy development encroaches on wilderness or on other currently undeveloped areas. Cumulative impacts on recreational use associated with the loss of wilderness values and general open desert scenery also could occur. While the effects cannot be quantified, desert users might avoid areas dominated by industrial-type solar facilities. This situation could result a fundamental change in the way the California Desert has been traditionally used.

9.4.22.4.5 Military and Civilian Aviation

The proposed Riverside East SEZ is located under eight MTRs, which are part of a very large, interconnected system of military aircraft training routes throughout the southwest. The development of any solar energy or transmission facilities that encroach into the airspace of MTRs could create safety issues and could interfere with military training activities. While the military has indicated that some portions of this SEZ are compatible with its existing use regardless of the proposed heights of solar facilities, while other portions should have height limits, and some areas may be incompatible with existing military use. Potential solar development occurring throughout the region, which is currently largely undeveloped, could result in small cumulative effects on the system of MTRs. Such effects would be limited by mitigations developed in consultation with the military.

Two civilian aviation facilities lie within 2 mi (3.2 km) of the SEZ and operations could be affected by solar facilities. In particular, fight operations at the Blythe Airport could be affected by facility structures and transmission lines, glint and glare, electromagnetic interference, bird attraction, and turbulence from thermal plumes above air-cooled condensers at the adjacent Blythe Solar Power Project (CACA 48811). While these effects may be low individually (CEC 2010c), small cumulative impacts on the Blythe Airport could result.

9.4.22.4.6 Soil Resources

Ground-disturbing activities (e.g., grading, excavating, and drilling) during the construction phase of a solar project, including any associated transmission lines, would contribute to soil loss due to erosion. Construction of new roads within the SEZ or improvements to existing roads would also contribute to soil erosion. During construction, operations, and decommissioning of the solar facilities, worker travel and other road use would also contribute to soil loss. These losses would be in addition to losses occurring as a result of disturbance caused by other users in the area, including from potential construction of several other renewable energy facilities, and recreational users, such as off-road vehicle enthusiasts. As discussed in Section 9.4.7.3, programmatic design features would be implemented to minimize erosion and loss of soil during the construction, operation, and decommissioning phases of the solar facilities and any associated transmission lines. Landscaping of solar energy facility areas could alter drainage patterns and lead to increased siltation of surface water streambeds, in addition to that caused by other development activities. Altering drainage patterns would in turn impact vegetation in washes and associated habitats supported by existing flows. Even with the expected design features in place, cumulative impacts from the disturbance of several large sites and connecting linear facilities in the vicinity could be significant.

9.4.22.4.7 Minerals (Fluids, Solids, and Geothermal Resources)

Currently, there are seven mining claims but no geothermal or oil and gas leases within the SEZ. It is assumed there would be no cumulative effect on mineral resources. The SEZ is still open for discretionary mineral leasing, including leasing for oil and gas and other leasable minerals.

9.4.22.4.8 Water Resources

The water requirements for development and operation of various utility-scale solar energy technologies on the proposed SEZ are described in Section 9.4.9.2. If the SEZ is fully developed over 80% of its available land area, the amount of water needed during the peak construction year for the various solar technologies evaluated would be 4,541 to 6,732 ac-ft (5.6 to 8.3 million m^3). The amount of water needed during decommissioning would be similar to or less than the amount used during construction. During operations, the amount of water needed for all solar technologies evaluated would range from 914 to 488,000 ac-ft/yr (1.1 to 603 million m^3/yr), with PV representing the lower end of this range. Since the availability of groundwater (the primary water resource available to solar energy facilities in the SEZ) is limited, it would not be feasible to obtain the upper end of the water requirements range. Assuming the maximum historical groundwater withdrawal rate of 9,100 ac-ft/yr (11.2 million m^3/yr) from the underlying groundwater basins is dedicated to solar energy production, the amount of wet-cooled trough or tower solar technology that could be built would be limited to on the order of 1,800 MW, or only about 5% of SEZ capacity if unlimited water was available. For dry-cooling options, about 12,800 MW could be produced, or about 39% and 71% of the estimated SEZ capacity for trough and tower technologies, respectively. Sustainable groundwater yields might represent even lower theoretical energy yields from these technologies. Conversely, PV development would have minimal impacts on groundwater sources, while dish engine technologies could be fully developed without exceeding recharge rates, particularly if water conservation measures were taken for mirror washing.

As of February 2010, 15 solar project applications were pending in the SEZ, including four fast-track solar applications, covering about 65% of the SEZ (Figure 9.4.22.-1). Impacts on the Chuckwalla Valley and Palo Verde Mesa groundwater basin would be large if several projects were built using wet-cooling trough or tower technologies. Water use is sustainable only if development in the proposed SEZ emphasizes deployment of PV and dish engine facilities and if deployment of trough and tower facilities is limited to the eastern portion of the proposed SEZ.

The development of the six advanced solar proposals identified within the geographic extent of effects (Section 9.4.22.2.1) could draw up to 8,000 ac-ft (9.9 million m^3/yr) of water to support construction during the period 2011–2013, and up to 2,700 ac-ft/yr (3.3 million m^3/yr) during the following operational period of approximately 30 years. Four of these projects, the four fast-track solar applications, are located within the proposed Riverside East SEZ and would draw from the Chuckwalla Valley and Palo Verde Mesa groundwater basin. In addition, the Eagle Crest pumped storage project would withdraw an initial 25,000 ac-ft (30.8 million m^3) from the Chuckwalla Valley basin and require makeup water of 2,400 ac-ft/yr (3.0 million m^3/yr) over its operating life. Some of the makeup water represents water lost to seepage back into the basin. The Rice Solar Energy Project, with construction water use of 780 ac-ft/yr (0.96 million m^3/yr) and operational water use of 180 ac-ft/yr (0.22 million m^3/yr), likely would not affect groundwater at the Riverside East SEZ, because the SEZ does not lie over the Rice Valley basin, which is separated from the Palo Verde Mesa basin by the Big Maria Mountains to the north (Section 9.4.9.1.2). Likewise, the several pending solar energy project proposals for locations off-site within 50 mi (80 km) of the SEZ, including those to the north in the Iron Mountain SEZ (Figure 9.4.22.2-1), if approved, would likely draw from other groundwater basins and thus not contribute significantly to cumulative impacts within the Riverside East SEZ. Therefore, cumulative impacts on groundwater basins underlying the Riverside East SEZ from currently foreseeable projects would be minimally greater than the impacts from solar energy development within the SEZ. Similarly, potential effects on surface waters and wetlands from drawdown of groundwater underlying the Riverside East SEZ would likely not extent to locations of other potential off-site solar projects.

The small quantities of sanitary wastewater that would be generated during the construction and operation of utility-scale solar energy facilities within the Riverside East SEZ in combination with similarly small volumes from other foreseeable projects would not be expected to strain available sanitary wastewater treatment facilities in the general area of the SEZ. Blowdown water from cooling towers for wet-cooled technologies would be treated within a project site (e.g., in settling ponds) and injected into the ground, released to surface water bodies, or reused, and thus would not contribute cumulative impacts to any nearby treatment systems.

9.4.22.4.9 Vegetation

The proposed SEZ is in a transitional area that includes many species associated with the Mojave and Sonoran Deserts within the Sonoran Basin and Range ecoregion, which supports creosotebush (*Larrea tridentata)*-bur sage (*Ambrosia dumosa*) plant communities with large areas of palo verde (*Cercidium microphyllum*)-cactus shrub and saguaro cactus (*Carnegiea gigantea*) communities. The western portion of the SEZ is within the Mojave Basin and Range ecoregion, which is characterized by broad basins and scattered mountains. Thirty-seven wetlands are located entirely or in part within the SEZ, with a total of 3,807 acres (15.4 km^2), while 113 wetlands are located within the indirect impact area within 5 mi (8 km) of the SEZ. Most wetlands are of the intermittent or ephemeral type.

Desert dry washes in the SEZ support woodlands that include ironwood, smoketree, and blue palo verde. An ironwood forest, identified by BLM as a Unique Plant Assemblage, occurs in the upper reaches of McCoy Wash. If utility-scale solar energy projects were to be constructed within the SEZ, all vegetation within the footprints of the facilities would likely be removed during clearing and grading of land. Vegetation communities primarily affected would be the Sonora-Mojave Creosotebush-White Bursage Desert Scrub cover type. Solar development could result in large impacts on North American Warm Desert Active and Stabilized Dune; moderate impacts on Sonora-Mojave Creosotebush-White Bursage Desert Scrub, North American Warm Desert Volcanic Rockland, North American Warm Desert Wash, North American Warm Desert Pavement, North American Warm Desert Playa, Sonora-Mojave Mixed Salt Desert Scrub, Developed, Open Space—Low Intensity, and North American Warm Desert Riparian Mesquite Bosque; and small impacts on the remaining cover types. Sand dune, playa, mixed salt desert scrub (primarily associated with Ford Dry Lake), and dry wash communities are important sensitive habitats in the region.

Numerous other renewable energy projects are proposed within a 50-mi (80-km) radius of the Riverside East SEZ. As many as 33 solar projects and 9 wind projects have pending applications within this distance, with ROW applications for solar applications alone totaling more than 400,000 acres (1,600 km^2), including more than 30,000 acres (120 km^2) for five of six advanced solar proposals on private and public land (Section 9.4.22.2.1). Depending on the actual development of renewable energy projects within and outside the SEZ and accompanying transmission lines, roads, and other infrastructure within the geographic extent of effects, cumulative impacts on certain cover types could be significant, particularly those that favor the basin flats, which are suitable for solar facilities. As other projects and transmission lines are added, natural corridors and safe germination sites may be lost; this would be detrimental to plant populations and ecosystem stability in the region.

In addition, the cumulative effects of fugitive dust generated during the construction of solar facilities along with other activities in the area, such as transportation and recreation, could increase the dust loading in habitats outside a solar project area. Increased dust loading could result in reduced productivity or changes in plant community composition. Programmatic design features would be implemented to reduce the impacts from solar energy projects and thus reduce the overall cumulative impacts on plant communities and habitats.

9.4.22.4.10 Wildlife and Aquatic Biota

As many as 173 species of amphibians (2 species), reptiles (31 species), birds (100 species), and mammals (40 species) occur in and around the proposed Riverside East SEZ (Section 9.4.11). The construction of utility-scale solar energy projects in the SEZ and of any associated transmission lines and roads in or near the SEZ would have impacts on wildlife through habitat disturbance (i.e., habitat reduction, fragmentation, and alteration), wildlife disturbance, loss of connectivity between natural areas (e.g., habitat fragmentation and blockage of dispersal corridors for bighorn sheep and desert tortoise), and wildlife injury or mortality. In general, affected species with broad distributions and occurring in a variety of habitats would be less affected than species with a narrowly defined habitat within a restricted area. Programmatic design features include pre-disturbance biological surveys to identify key habitat areas used by wildlife, followed by avoidance or minimization of disturbance to those habitats (e.g., Ford Dry Lake and Palen Lake).

Up to 33 other solar projects and 9 wind projects have pending applications within 50 mi (80 km) of the SEZ, while the proposed Iron Mountain SEZ about 25 mi (40 km) to the north.

ROW applications for solar projects alone total more than 400,000 acres (1,600 km^2), including over 30,000 acres (120 km^2) for five of six advanced solar proposals on private and public land (Section 9.4.22.2.1). Depending on the actual development of renewable energy projects within and outside the SEZ and of accompanying transmission lines, roads, and other infrastructure within the geographic extent of effects, cumulative impacts on some wildlife species could be significant, particularly those species with habitats or migratory routes in the basin flats, which are suitable for solar facilities.

While many of the wildlife species have extensive habitat available within the affected counties, in cases where projects are closely spaced, the cumulative impact on a particular species could be moderate to large. Programmatic design features would be implemented to reduce the impacts from solar energy projects and thus reduce the overall cumulative impacts on wildlife. However, even with mitigations in place, cumulative impacts could be moderate within the geographic extent of effects.

No perennial or intermittent streams occur within the proposed Riverside East SEZ, but numerous dry washes are inundated after rain events; both Palen Lake and Ford Dry Lake are intermittent and rarely have standing water. Temporary ponding may occur in Palen Lake. Similarly, wetlands within the SEZ are intermittently flooded, so surface water is usually absent but may be present for variable periods. Consequently, no aquatic habitat or communities are likely to be present for an extended time within the SEZ. The intermittent wetlands and dry lakes present within and around the SEZ could be affected by runoff of water and sediment from the SEZ, especially if ground disturbance occurred near Palen Lake. However, with programmatic design features in place, the potential for indirect impacts on aquatic habitats and organisms within the region is small. Within the geographic extent of effects (50-mi [80 km] radius), water taken from perennial surface water features could affect water levels and, as a consequence, aquatic organisms in those water bodies. Thus, there would be small cumulative impacts on aquatic biota and habitats resulting from solar development in the region. Similarly, increased future demand on groundwater for multiple uses, including solar power development within the SEZ, could affect surface water levels outside of the SEZ and, as a consequence, could affect aquatic organisms in those water bodies.

9.4.22.4.11 Special Status Species (Threatened, Endangered, Sensitive, and Rare Species)

Thirty special status species are known to occur within the affected area of the Riverside East SEZ. Of these species, the Coachella Valley milkvetch is listed as endangered, and the desert tortoise is listed as threatened under the ESA; nine are listed as BLM-designated sensitive; and the remaining 19 species are considered rare. Numerous additional species occurring on or in the vicinity of the SEZ are listed as threatened or endangered by the states of California or Arizona or are listed as a sensitive species by the BLM. Potential mitigation measures that could be used to reduce or eliminate the potential for cumulative effects on these species from the construction and operation of utility-scale solar energy projects within the geographic extent of effects include avoidance of habitat, translocation of individuals, and minimization of erosion, sedimentation, and dust deposition.

Numerous reasonably foreseeable future actions could occur within the geographic extent of effects of the proposed Riverside East SEZ, including 33 solar and 9 wind applications for projects that would cover up to 400,000 acres (1,600 km^2). A number of sensitive species have been identified within the boundaries of the six advanced solar proposals covering 30,000 acres (120 km^2), including the four fast-track solar energy proposals within the proposed Riverside East SEZ (Section 9.4.22.2.1). These species include the federally or state-listed desert tortoise, Mojave fringe-toed lizard, Colorado fringe-toed lizard, Western burrowing owl, short-eared owl, prairie falcon, northern harrier, loggerhead shrike, California horned lark, desert kit fox, and several California-listed sensitive plant species.

In addition, the proposed Iron Mountain SEZ is about 25 mi (40 km) north of the Riverside East SEZ. Many special status species with potential habitat impacts from solar development are common to both the Riverside East and Iron Mountain SEZs, including the desert tortoise and Mojave fringe-toed lizard. However, projects in these and other areas would employ design features to reduce or eliminate the impacts on protected species as required by the ESA and other applicable federal and state laws and regulations.

Depending on the number and size of other projects that will actually be built within the next 20 to 30 years within the geographic extent of effects, there could be cumulative impacts on protected species due to habitat destruction and overall development and fragmentation of the area. Habitats that are particularly at risk are those in basin flats, which are suited for solar development. Together, several new solar facilities and the other associated actions would have a cumulative impact on wildlife. Where projects are closely spaced, the cumulative impact on a particular species could be moderate to large.

9.4.22.4.12 Air Quality and Climate

While solar energy generates minimal emissions compared with fossil fuel–generated energy, the site preparation and construction activities associated with solar energy facilities would produce some emissions, mainly particulate matter (fugitive dust) and emissions from vehicles and construction equipment. When these emissions are combined with those from other projects near solar energy facilities or when they are added to natural dust generated by winds and windstorms, the air quality in the general vicinity of the projects could be temporarily degraded. For example, particulate matter (dust) concentration at or near the SEZ boundaries could at times exceed state or federal ambient air quality standards. Generation of dust from construction activities can be partially controlled by implementing aggressive dust control measures, such as increased watering frequency or road paving or treatment, and/or sound practices such as minimizing activities under unfavorable meteorological conditions.

Several other renewable energy projects are proposed or planned within the air basin shared by Riverside East (Section 9.4.22.2.1 and Figure 9.4.22.2-1), while the proposed Iron Mountain SEZ is about 25 mi (40 km) north. Concurrent construction of solar facilities at the two SEZs could have cumulative impacts. Four fast-track proposed projects lie in the Riverside East SEZ, while a total of 33 solar and 9 wind proposals are pending within 50 mi (80 km) of the Riverside East SEZ. The fast-track projects have overlapping construction schedules for the period 2011 to 2013. These projects in combination with others with pending applications could produce periods of elevated particulate emissions in the affected area.

Over the long term and across the region, the development of solar energy may have beneficial cumulative impacts on the air quality and atmospheric values in southern California by offsetting the need for energy production with fossil fuels, which results in higher levels of emissions. As discussed in Section 9.4.13, air emissions from operating solar energy facilities are relatively minor, while the displacement of criteria air pollutants, VOCs, TAPs, and GHG emissions currently produced from fossil fuels could be relative large. For example, if the Riverside East SEZ is fully developed (80% of its acreage) with solar facilities, the quantity of pollutants avoided could be as large as 54% of all emissions from the current electric power systems in California (Section 9.4.13.2.2).

9.4.22.4.13 Visual Resources

The proposed Riverside East SEZ is within the Mojave basin and range physiographic province, typified by small, rocky mountain ranges with jagged peaks alternating with talus slopes and desert floor. The proposed SEZ site is in the flat plains of the Chuckwalla (including the McCoy Wash area east of the McCoy Mountains) and Palen Valley floors, with the strong horizon line and several mountain ranges surrounding the valley being the dominant visual features. The VRI values for the SEZ and immediate surroundings are VRI Class II, indicating high relative visual values; Class III, indicating moderate relative visual values; and Class IV, indicating low relative visual values. The inventory indicates moderate scenic quality for the Chuckwalla Valley and high sensitivity for the SEZ lands near Joshua Tree NP and for the Class II area in the southeastern portion of the SEZ, based on heavy recreational use, the presence of a BLM scenic highway and historic trails, and proximity to congressionally designated wilderness and areas of critical environmental concern.

Development of utility-scale solar energy projects within the SEZ would contribute to the cumulative visual impacts in the general vicinity of the SEZ and in the Chuckwalla and Palen valleys. However, the exact nature of the visual impacts and the design features that would be appropriate would depend on the specific project locations within the SEZ and on the solar technologies used. Such impacts and potential design features would be considered in visual analyses conducted for specific future projects. In general, large visual impacts on the SEZ would be expected to occur as a result of the construction, operation, and decommissioning of utility-scale solar energy projects. These impacts would be expected to involve major modification of the existing character of the landscape and would likely dominate the views for some nearby observers. Additional impacts would occur as a result of the construction, operation, and decommissioning of related facilities, such as access roads and electric transmission lines.

Because of the large size of utility-scale solar energy facilities, the large number of pending applications on public lands in the area, and the generally flat, open nature of the proposed SEZ, some lands outside the SEZ would also be subjected to visual impacts related to the construction, operation, and decommissioning of utility-scale solar energy development.

Potential impacts would include night sky pollution, including increased skyglow, light spillage, and glare. Some of the affected lands outside the SEZ would include potentially sensitive scenic resource areas, including large portions of the mountain ranges surrounding the Chuckwalla Valley and some neighboring valleys, including Ward and Rice Valleys, and the Pinto Basin, which could be subject to visual impacts associated with solar energy development within the SEZ. The magnitude of visual impacts on these sensitive areas would range from minimal to major. Visual impacts resulting from solar energy development within the SEZ would be in addition to visual impacts caused by other potential projects in the area, such as other solar facilities on private lands, transmission lines, and other renewable energy facilities, including windmills. The presence of new facilities would normally be accompanied by increased numbers of workers in the area, traffic on local roadways, and support facilities, all of which would add to cumulative visual impacts.

As many as 33 other solar projects and 9 wind projects have pending applications on public lands within 50 mi (80 km) of the proposed Riverside East SEZ, including 15 solar applications within the SEZ. In addition, the proposed Iron Mountain SEZ is about 25 mi (40 km) north of the Riverside East SEZ. While the overall extent of cumulative effects of renewable energy development in the area would depend on the number of projects actually built, it may be concluded that these projects could transform the general visual character of the landscape from primarily rural desert to more commercial-industrial. Because of the topography of the region, solar facilities, located in flat basins, would be visible at great distances from sensitive viewing locations in the surrounding mountains. Also, the facilities would be located near major roads, thus the facilities would be viewable by motorists. However, some portions of major roads where solar energy facilities would be located, including I-10, are currently visually affected by transmission line corridors, towns, and other infrastructure, as well as the road system itself.

In addition to cumulative visual impacts associated with views of particular future facilities, as additional facilities are added, several projects might become visible from one location or in succession as viewers move through the landscape, such as driving on local roads. In general, the new facilities would vary in appearance, and depending on the number and type of facilities, the resulting visual disharmony could exceed the visual absorption capability of the landscape and add significantly to the cumulative visual impact. Thus, the overall cumulative visual impacts in the region from solar and wind energy development would be significant.

9.4.22.4.14 Acoustic Environment

The areas around the proposed Riverside East SEZ and in Riverside County in general are relatively quiet. Existing noise sources include road traffic, railroad traffic, aircraft flyovers, agricultural activities, and activities and events at nearby residences. A number of residences are scattered along the SEZ boundaries, while population centers with schools include Desert Center, located at the southwestern edge of the SEZ, and Blythe, located about 5 mi (8 km) east of the eastern SEZ boundary. During construction of solar energy facilities, construction equipment could increase the noise levels over short periods during the day. After the facilities are constructed and begin operating, there would be little or minor noise impacts from any of the technologies, except for solar dish engine facilities and parabolic trough or power tower facilities using TES. It is possible that residents could be cumulatively affected by more than one solar or other development built in or near the SEZ, particularly at night when the noise is more discernable due to relatively low background levels. However, such cumulative impacts are unlikely due the expected wide separation of facilities and the sparse population of the region.

9.4.22.4.15 Paleontological Resources

The potential for impacts on significant paleontological resources at the Riverside East SEZ as a whole is relatively unknown, but the potential is high in some areas. Further, the specific sites selected for future projects would be surveyed if determined necessary by the BLM, and any paleontological resources encountered would be avoided or mitigated to the extent possible. A similar process would be employed at other facilities constructed in the area, and no significant cumulative impacts on paleontological resources are expected.

9.4.22.4.16 Cultural Resources

The proposed Riverside East SEZ is located in a transitional area between the Colorado Desert to the south and the Mojave Desert to the north. The area of the SEZ was important as a source of seasonal resources to surrounding Native American groups and includes important trails that connect them. Some trails have spiritual significance, while the surrounding mountains are regarded as sacred, with some peaks having special status. Other culturally important features include caves, rock formations, and springs. Revered locations included panels of rock art, ancestral settlements, arranged-rock sites, and burial or cremation areas. Direct impacts on significant cultural resources during site preparation and construction activities could occur in the proposed Riverside East SEZ. However, further investigation would be needed, including a cultural resource survey of the entire area of potential effects to identify archaeological sites, historic structures and features, and traditional cultural properties in project areas. Numerous cultural surveys have been conducted in the vicinity of the SEZ, including surveys at project sites within the SEZ with fast-track applications (Section 9.4.22.2.1) and have identified a number of prehistoric and historic sites at the project locations. It is possible that the development of utility-scale solar energy projects in the proposed Riverside East SEZ and of other projects likely to occur in the area could contribute cumulatively to cultural resource impacts, in particular along the I-10 corridor. However, historic properties would be avoided or mitigated to the extent possible, in accordance with state and federal regulations. Similarly, through ongoing consultation with the California SHPO and appropriate Native American governments, it is likely that many adverse effects on significant resources within the geographic extent of effects could be mitigated to some extent. Some visual and landscape scale impacts may not be mitigable to the satisfaction of all interested parties. The increment of adverse effects from solar energy development on the overall cumulative effect on cultural resources would depend on the nature of the resources affected and could be significant.

9.4.22.4.17 Native American Concerns

All federally recognized Tribes with traditional ties to the area of the proposed Riverside East SEZ have been contacted so that they could identify their concerns regarding solar energy development. The concerns of Native Americans, including the Serrano, Cahuilla, Quechan, Mohave, and Chemehuevi, over other energy development projects in the region have been documented. The Chemehuevi and NALC have expressed concerns over the Salt Song Trail, and the Quechan Indian Tribe of the Fort Yuma Reservation stressed the importance of evaluating impacts on landscapes as a whole within their Tribal Traditional Use Area. Solar development within the SEZ could have adverse effects on these and other Native American concerns even after mitigations are applied. It is further possible that the development of utility-scale solar energy projects in the SEZ, when added to other potential projects likely to occur in the area, including renewable energy projects outside the SEZ, could contribute cumulatively to visual impacts on their traditional landscape and the destruction of other resources in the valley important to Native Americans. Continued discussions with the area Tribes through government-to-government consultation is necessary to effectively consider and address the Tribes' concerns related to solar energy development in the region.

9.4.22.4.18 Socioeconomics

Solar energy development projects in the proposed Riverside East SEZ could cumulatively contribute to socioeconomic effects in the immediate vicinity of the SEZ and in the surrounding multicounty ROI. The effects could be positive (e.g., creation of jobs and generation of extra income, increased revenues to local governmental organizations through additional taxes paid by the developers and workers) or negative (e.g., added strain on social institutions such as schools, law enforcement agencies, and health care facilities). Impacts from solar development would be most intense during facility construction, but of greatest duration during operations. Construction in the Riverside East SEZ and at other new projects in the area, including other renewable energy projects, would temporarily increase the number of workers in the area needing housing and services. The number of workers involved in the construction of solar projects in the proposed Riverside East SEZ alone could range from about 400 to 5,200 in the peak construction year, depending on the solar technology being developed, with solar PV facilities at the low end and solar trough facilities at the high end. The total number of jobs created in the area could range from approximately 1,200 (solar PV) to as high as 16,000 (solar trough).

Cumulative socioeconomic effects in the ROI from construction of solar facilities would occur to the extent that multiple construction projects of any type were ongoing simultaneously. It is a reasonable expectation that this condition would occur within a 50-mi (80 km) radius of the SEZ occasionally over the 20-year or more solar development period. Six anticipated projects with advanced proposals, including four fast-track projects located within the Riverside East SEZ, would employ up to 2,300 construction workers during the period 2011 to 2013 (Section 9.4.22.2.1). This number of workers could place a modest short-term strain on local resources in this sparsely populated area.

Annual impacts during the operation of solar facilities would be less, but could last 20 to 30 years, and could combine with those from other new projects in the area. The number of workers needed at the solar facilities within the SEZ would range from 350 to 7,100, with approximately 500 to 11,700 total jobs created in the region. In addition, approximately 460 operation workers are estimated for the five of six projects with advanced proposals in the area (Section 9.4.22.2.1). Population increases resulting from renewable energy development within 50 mi (80 km) of the Riverside East SEZ would contribute to general population growth experienced in the region in recent years. The overall socioeconomic impacts would be positive, through the creation of additional jobs and income. The negative impacts, including some short-term disruption of rural community quality of life, would not be considered large enough to require specific design features.

9.4.22.4.19 Environmental Justice

Environmental impacts associated with solar facilities within the proposed Riverside East SEZ potentially affecting minority and low-income populations include noise and dust during the construction of solar facilities; noise associated with solar project operations; the visual impacts of solar facilities and transmission lines; access to land used for economic, cultural, or religious purposes; and effects on property values. However, such effects from solar development within the proposed Riverside East SEZ would be small and would not be expected to contribute to cumulative impacts on minority and low-income populations with the 50-mi (80-km) geographic extent of effects.

9.4.22.4.20 Transportation

During construction activities, up to 1,000 workers could be commuting to a single construction site at the SEZ, which would be less than 10% of the current traffic on I-10 near the SEZ. Should up to three large projects with approximately 1,000 daily workers each be under development simultaneously, an additional 6,000 vehicle trips per day could be added to I-10, an approximate 30% increase, which could have small to moderate impacts on traffic flow during peak commute times.

Further, if construction occurred concurrently in the proposed Riverside East and Iron Mountain SEZs, which are about 25 mi (40 km) apart and both served by State Route 177/62, the increase in traffic during shift changes could be significant. Local road improvements may be necessary near site access points. Any impacts during construction activities would be temporary. The impacts could be mitigated to some degree by having different work hours within an SEZ or between the two SEZs. Traffic increases during operation would be reduced because of the lower number of workers needed to operate solar facilities and would have a smaller contribution to cumulative impacts.

9.4.23 References

Note to Reader: This list of references identifies Web pages and associated URLs where reference data were obtained for the analyses presented in this PEIS. It is likely that at the time of publication of this PEIS, some of these Web pages may no longer be available or their URL addresses may have changed. The original information has been retained and is available through the Public Information Docket for this PEIS.

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