DOE/EA-1736

Final Environmental Assessment for the Expansion of the Sanitary Effluent Reclamation Facility and Environmental Restoration of Reach S-2 of Sandia Canyon at Los Alamos National Laboratory Los Alamos, New Mexico

August 24, 2010

Department of Energy
National Nuclear Security Administration
Los Alamos Site Office

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EXECUTIVE SUMMARY

This Environmental Assessment (EA) considers two separate actions, the expansion of the Sanitary Effluent Reclamation Facility (SERF) and environmental restoration activities located within a portion of upper Sandia Canyon, designated as reach S-2. Both of these actions would take place adjacent to or within upper Sandia Canyon at Los Alamos National Laboratory (LANL).

The SERF is a wastewater treatment facility located on the south rim of Sandia Canyon. The National Nuclear Security Administration (NNSA) is considering expanding SERF to improve wastewater treatment to meet effluent limitations for PCBs imposed in National Pollutant Discharge Elimination System (NPDES) Permit NM0028355. The permit requires compliance with these limitations by July 30, 2012. The two action alternatives considered for the SERF expansion project each include the expansion of the existing facility and the distribution of treated effluent for non-potable water reuse to LANL facilities located within TA-3. These two SERF alternatives differ with regard to the amount of treated effluent reused as cooling tower and boiler makeup water, and the amount of treated effluent that could be discharged back to the environment via NPDES-permitted outfalls into upper Sandia Canyon.

Possible environmental restoration activities that could be implemented within the upper end of Sandia Canyon are also considered in this EA. The Sandia Canyon watershed is being evaluated pursuant to the 2005 Compliance Order on Consent (Consent Order). Activities to be performed in the Consent Order are similar to those that have taken place for years at LANL (such as drilling exploratory wells or performing contaminated soil removals), but the timing and extent of some activities may be different from those previously anticipated. Regardless of the alternative for expansion of the SERF that is selected by NNSA, appropriate actions will be taken to investigate and remediate contaminated sediment in the Sandia Canyon watershed under the provisions of the Consent Order.

The EA includes descriptions in general terms of the action alternatives for the SERF project and potential environmental restoration action measures that may be implemented. It also describes the No Action Alternative for each action. For the SERF, the No Action Alternative would be the use of the existing SERF to treat a limited amount of sanitary effluent for reuse without any structural enlargement or addition of extra equipment, storage tanks, or other pumps or piping structures. For the environmental restoration action measures in reach S-2, the No Action Alternative would be the status quo with no additional stabilization in place or soil removal actions performed.

These two separate actions—the proposed SERF expansion project and the potential environmental restoration action measures—will have different decision makers. NNSA will make a decision among the alternatives analyzed for the SERF project. The New Mexico Environment Department (NMED) will make the decision(s) for environmental restoration of reach S-2 under the provisions of the Consent Order, and then the Department of Energy (DOE) will make associated implementing decisions for the environmental restoration actions selected by NMED.

Because these separate actions potentially affect a common geographical location (reach S-2) and may have overlapping time frames, NNSA has chosen to consider both actions in the same

EA. Each separate action has the potential to result in direct, indirect, and cumulative environmental impacts that could affect a common set of natural resources and receptors located nearby and within the upper reach of Sandia Canyon. Given the different regulatory goals that each decision maker will address, as well as the potential environmental impacts and other decision making elements, there are several combinations of different alternatives that could be implemented.

This EA has been prepared to assess the potential environmental consequences of implementing two expansion action alternatives at the SERF that are discussed in Sections 2.6.1 (Partial Reuse Alternative) and 2.6.2 (Total Reuse Alternative). Under the Partial Reuse Alternative, the SERF would be expanded to an operational treatment capacity of approximately 400,000 gal./d (1.514 million L/d). The expanded treatment capacity would allow the SERF to treat 100 percent of the Sanitary Wastewater System (SWWS) Plant effluent to meet NPDES discharge limits for Outfall 001, and also to treat Strategic Computing Complex (SCC) and Laboratory Data Communications Center (LDCC) cooling tower blowdown and Power Plant boiler blowdown. Up to 100 percent of the SERF effluent would be recycled for water reuse at the SCC, resulting in up to a 60 percent reduction in the potable water demands of the TA-3 facilities. Distribution piping would be installed to connect the facilities. Outfall 03A027 would be combined with Outfall 001, resulting in the elimination of one NPDES outfall. Under the Total Reuse Alternative, the SERF would be expanded as previously described, and up to 100 percent of the SERF effluent would be recycled for water reuse at the SCC, LDCC, or the Power Plant to meet the goal of zero effluent discharge into Sandia Canyon from the SERF, resulting in up to a 75 percent reduction in potable water demands of the TA-3 facilities. Also under the Total Reuse Alternative, about 1,000 ft (305 m) of additional distribution piping would be installed to convey treated effluent to the LDCC cooling towers and to the TA-3 Power Plant.

This EA also assesses the potential environmental consequences of implementing two environmental restoration action alternatives in reach S-2 of Sandia Canyon that are discussed in Sections 2.8.1 (Stabilization in Place with Long-term Monitoring) and 2.8.2 (Removal with Off-site Disposal). The first alternative would involve the installation of a grade control structure at the eastern (downstream) end of reach S-2. The structure would stabilize the stream channel and prevent stream flow—especially during storm runoff events—from incising a deeper channel, mobilizing contaminated sediments, and lowering the water table. The second alternative considered in the EA for the environmental restoration of reach S-2 would be to excavate all sediment and soils with contamination above specified action levels, using heavy machinery such as dozers, back hoes, front-end loaders, and dump trucks. An upper bounding limit of approximately 100,000 yd^3 (76,579 m^3) of contaminated sediments and soils would be removed. The sediment and soils excavated from reach S-2 would be containerized, characterized for waste management purposes, and then transported by truck to an appropriate licensed off-site disposal facility. It is estimated that between 5,000 to 10,000 shipments by truck may be required, with 10 to 20 yd^3 (8 to 15 m^3) of sediments and soil transported in each truckload. An equal number of truckloads would be required to import clean fill to the excavated area.

SERF and Environmental Restoration No Action Alternatives were also considered. Under the SERF No Action Alternative, the SERF expansion would not be implemented and the existing SERF facility would be operated, as previously described, to treat approximately 100,000 gal./d (378,541 L/d) of the SWWS Plant effluent. The treated effluent would then be reused at the SCC to meet a portion of the potable water demands at that facility. The remainder of the SWWS Plant effluent, without undergoing enhanced SERF treatment, would continue to be discharged to Sandia Canyon via Outfall 001. NPDES effluent limitations for PCBs would not be met and LANL would be in violation of its NPDES permit and subject to fines, or NNSA and Los Alamos National Security, LLC would need to renegotiate the permit.

Under the Environmental Restoration No Action Alternative, DOE would undertake no remediation activities in reach S-2. However, monitoring and investigation of site conditions and site contamination would continue as directed by the Consent Order or subsequent NMED direction.

Best management practices for soil erosion control would be implemented during construction activities at the grade control structure location in reach S-2. An NPDES General Permit Notice of Intent would be filed. A Stormwater Pollution Prevention Plan would be required for construction activities involving soil disturbance as part of NPDES permit compliance. A one-lane access road would be constructed from the south rim of Sandia Canyon in TA-3 to the canyon near the upper end of reach S-2.

Implementation of the action alternatives would not adversely affect geology and soils, water resources, water quality, air quality in the Los Alamos airshed, noise, human health, and infrastructure and utilities. Implementation of the Total Reuse Alternative or the Removal with Off-site Disposal Alternative would greatly reduce or eliminate a 3-acre (1.2 hectare) wetland in reach S-2. A floodplain assessment is provided in Appendix A of the EA. Wetland compensation would be provided for lost wetland acreage.

Implementation of the Removal with Off-site Disposal Alternative would generate large amounts of solid waste for removal. However, the types and quantities of waste generated by the excavation and removal activities at reach S-2 would not likely result in substantial effects to the much larger volume of environmental restoration waste at LANL. Implementation of the Removal with Off-site Disposal Alternative would be expected to have only minor short-term and temporary effects on current traffic patterns associated with shipments of 5,000 to 10,000 truck loads of sediment and soils with contamination above specified action levels in reach S-2, and involvement of an equivalent number of truck loads of clean fill to reclaim excavated areas.

Mitigation measures to address adverse impacts are included in the description of impacts and a Mitigation Action Plan is included in Appendix B of the EA. Mitigation measures that DOE and NNSA commit to implementing along with action alternatives include provisions for addressing potential impacts to ecological resources (threatened and endangered species; game animals and other small mammals and birds; wetlands), surface and groundwater quality, and cultural resources and Traditional Cultural Properties.

Cumulative effects of the action alternatives, along with past, present, and reasonably foreseeable actions on LANL and surrounding lands, are anticipated to be negligible. No increases in LANL operations are anticipated as a result of this action.

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FIGURES

TABLES

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ACRONYMS AND TERMS

°C	degrees Centigrade
°F	degrees Fahrenheit
ac	acre
AEI	Areas of Environmental Interest
ACHP	Advisory Council on Historic Preservation
AOC	area of concern
APE	Area of Potential Effect
AQCR	Air Quality Control Region
asl	above sea level
BMP	best management practice
CAA	Clean Air Act
CFR	Code of Federal Regulations
cm	centimeter
CMR	Chemistry and Metallurgy Research facility
Consent	Compliance Order on Consent Order
COPC	Chemicals of Potential Concern
CRMP	Cultural Resources Management Plan
CWA	Clean Water Act
d	day
DARHT	Dual Axis Radiographic Hydrodynamic Testing facility
dB	decibels
dBA	A-weighted frequency scale
DOE	(U.S.) Department of Energy
EA	environmental assessment
EIS	Environmental Impact Statement
EO	Executive Order
EPA	(U.S.) Environmental Protection Agency
ER	environmental restoration
ESA	Endangered Species Act
ESCP	erosion and sediment control plan
FE	federally endangered
FEMA	Federal Emergency Management Agency
FONSI	Finding of No Significant Impact
FT	federally threatened
ft	feet
ft^2	square feet
µg	microgram

gal.	gallons
gal./d	gallons per day
gal./min	gallons per minute
GWQB	Ground Water Quality Bureau
ha	hectare
HABS	Historic American Building Survey
HCPI	Historic Cultural Property Inventory
HEWTF	High Explosives Wastewater Treatment Facility
in.	inches
lb	pound
km	kilometers
km^2	square kilometers
kph	kilometers per hour
kV	kilovolts
kVA	kilovolt-ampere
L	liters
L/d	liters per day
LANL	Los Alamos National Laboratory
LANS	Los Alamos National Security, LLC
LANSCE	Los Alamos Neutron Science Center
LDCC	Laboratory Data Communications Center
LEDA	Low-Energy Demonstration Accelerator
m	meters
m^2	square meters
mi	miles
mi^2	square miles
mph	miles per hour
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
NEPA	National Environmental Policy Act of 1969
NHPA	National Historic Preservation Act
NMCRIS	New Mexico Cultural Resources Information System
NMED	New Mexico Environment Department
NMGF	New Mexico Game and Fish Department
NMWQCC	New Mexico Water Quality Control Commission
NNSA	National Nuclear Security Administration
NPDES	National Pollutant Discharge Elimination System
NRHP	National Registry of Historic Places

PAH	polycyclic aromatic hydrocarbons
PCB	polychlorinated biphenyl
PPE	personal protective equipment
RCRA	Resource Conservation and Recovery Act
RLWTF	Radioactive Liquid Waste Treatment Facility
RO	reverse osmosis
RS	Rock Outcrop, Steep
SC	state special concern
SCC	Strategic Computing Complex
SE	state endangered
SERF	Sanitary Effluent Reclamation Facility
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SR	state road
SSC	Species of Special Concern
SSL	soil screening level
ST	state threatened
SVOC	semi volatile organic compound
SWEIS	Site-Wide Environmental Impact Statement
SWMUs	solid waste management units
SWPPP	Storm Water Pollution Prevention Plan
SWQB	Surface Water Quality Bureau
SWWS	Sanitary Wastewater System
TA	Technical Area
T&E	threatened and endangered
TCP	traditional cultural property
TMDL	total maximum daily load
TSCA	Toxic Substances Control Act
TSDF	Temporary Storage and Disposal Facility
TLV	threshold limit value
TSTA	Tritium Systems Test Assembly
U.S.	United States
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
VOC	volatile organic compound
WQMP	water quality management plan
yd^3	cubic yards

EXPONENTIAL NOTATION: Many values in the text and tables of this document arc expressed in exponential notation. An exponent is the power to which the expression, or number, is raised. This form of notation is used to conserve space and to focus attention on comparisons of the order of magnitude of the numbers (sec examples):

1×10^{4}	=	10,000
1×10^{2}	=	100
1×10^{0}	=	1
1×10^{-2}	=	0.01
1×10^{-4}	=	0.0001

Metric Conversions Used in this Document

Multiply	By	To Obtain
Length		
inch (in.)	2.54	centimeters (cm)
feet (ft)	0.30	meters (m)
yards (yd)	0.91	meters (m)
miles (mi)	1.61	kilometers (km)
Area		
acres (ac)	0.40	hectares (ha)
square feet (ft^2)	0.09	square meters (m^2)
square yards (yd^2)	0.84	square meters (m^2)
square miles (mi^2)	2.59	square kilometers (km^2)
Volume		
gallons (gal)	3.79	liters (L)
cubic feet (ft^3)	0.03	cubic meters (m^3)
cubic yards (yd^3)	0.76	cubic meters (m^3)
Weight		
ounces (oz)	28.35	grams (g)
pounds (Ib)	0.45	kilograms (kg)
short ton (ton)	0.91	metric ton (t)

CHAPTER 1

1.0 PURPOSE AND NEED FOR AGENCY ACTION

1.1 INTRODUCTION

The *National Environmental Policy Act* of 1969 (NEPA), as amended (42 U.S.C.4321 et seq.), requires federal agencies to consider the environmental consequences of proposed actions before making decisions. In complying with NEPA, the Department of Energy (DOE) and the National Nuclear Security Administration (NNSA)[1] follow the Council on Environmental Quality regulations (40 Code of Federal Regulations [CFR] 1500-1508) and DOE's own NEPA implementing procedures (10 CFR 1021). The purpose of an Environmental Assessment (EA) is to provide DOE and NNSA with sufficient evidence and analysis to determine whether to issue a Finding of No Significant Impact (FONSI) or to prepare an Environmental Impact Statement (EIS).

At this time, NNSA is considering a proposed action that would expand the size and operational capacity of a wastewater treatment facility, known as the Sanitary Effluent Reclamation Facility (SERF), located on the south rim of Sandia Canyon within Los Alamos National Laboratory (LANL). This expansion project would include the installation of associated storage tanks, pumps, piping, and equipment necessary to distribute the treated water for reuse at LANL facilities. Depending on the amount of treated water ultimately reused, this action could reduce or eliminate the amount of wastewater currently discharged into the upper portion of Sandia Canyon.

DOE is also considering possible action measures for addressing the potential migration of contaminated sediment located within upper Sandia Canyon. The contamination primarily consists of chromium and polychlorinated biphenyls (PCBs). Years of surface water flow from daily LANL wastewater releases and periodic storm events have created a broad, 3-acre (1.2 hectare) wetland and also laid down a major sediment deposit in the canyon bottom area. About 80 to 90 percent of the chromium and PCB contamination within the Sandia Canyon watershed sediment deposits is located within this portion of upper Sandia Canyon, designated as reach S-2. Surface water flows from LANL waste water release points across the upper canyon by way of a well-defined stream channel. Erosion of the sediment along the stream channel is occurring, which in turn accelerates the movement of contaminants toward the regional aquifer. Therefore, interim actions may be needed to reduce or prevent migration of contaminants, while long-term corrective action remedies are evaluated and implemented for the entire Sandia Canyon watershed.

The treatment facility expansion and the environmental restoration action measures both have the potential to cause direct, indirect, and cumulative impacts affecting the same natural ecosystem and set of natural resource elements near and within upper Sandia Canyon. In order to assess the

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[1] NNSA is a semiautonomous agency within DOE (see *National Nuclear Security Administration Act* [Title 32 of the *Defense Authorization Act* for fiscal year 2000, Public Law 106-65]). DOE and NNSA have different responsibilities. In general, NNSA is responsible for ongoing operations at LANL, while DOE is responsible for environmental remediation and restoration. For that reason, NNSA is the decision maker on the proposed expansion of the SERF, while DOE would be responsible for any environmental restoration activities in Reach S-2.

possible impacts and any potential for overlapping effects to common resource elements, DOE and NNSA have decided to prepare a single EA to consider both activities.

The objectives of this EA are to (1) describe the baseline environmental conditions at the involved locations within LANL, (2) analyze the potential effects to the existing environment from the project alternatives and action measures under consideration, and (3) compare the effects of those alternatives and action measures to the No Action Alternatives. In addition, the EA will provide DOE and NNSA with environmental information for developing mitigation actions to minimize, or avoid, adverse impacts to the integrity of the human environment, natural ecosystems, and resource elements if the decision makers decide to proceed with the project alternative(s) under consideration. Ultimately, the goal of NEPA and this EA is to aid federal government officials in making decisions based on an understanding of the potential environmental consequences of the actions undertaken at LANL.

1.2 BACKGROUND

LANL is a multiprogram facility administered for the federal government by the NNSA. Located in north-central New Mexico, LANL is an important element in the nation's security strategy (Figure 1-1). It is a multidisciplinary, multipurpose institution primarily engaged in theoretical and experimental research and development with responsibility for some manufacturing activities of nuclear weapons components.

LANL is located about 60 mi (97 km) north-northeast of Albuquerque, 25 mi (40 km) northwest of Santa Fe, and 20 mi (32 km) southwest of Española in Los Alamos and Santa Fe Counties. The LANL region is characterized by forested areas with mountains, mesas, canyons, and valleys as well as diverse cultures and ecosystems. LANL occupies about 40 mi^2 (104 km^2) divided into 48 designated technical areas (TAs). Over 2,000 structures at LANL are used for laboratory, production, administrative, storage, services, and other purposes. These structures occupy about 8.6 million ft^2 (800,000 m^2) of space under roof. The majority of the larger structures are concentrated within or immediately adjacent to Technical Area 3 (TA-3). Most of the LANL buildings routinely occupied by workers are located along the mesa tops within the LANL boundary. Twelve watersheds cross within LANL boundaries, trending west to east, and drain the Pajarito Plateau to the Rio Grande (DOE 2008).

Many LANL operations historically discharged industrial wastewater directly to the LANL environment through numerous industrial wastewater outfalls. The volume of wastewater and the level of treatment it received have varied over time, as have the generating sources and the number of discharge outfalls. Similarly, many LANL operations historically produced other wastes that were released to the LANL environment through wastewater pipes and drains directly onto the ground into ditches and canyons or into excavated pits. These past LANL operational practices, coupled with stormwater and snowmelt runoff, have resulted in the contamination of canyon sediments within LANL watersheds.

Over the past several decades, DOE, NNSA, and the LANL management and operations contractor (currently Los Alamos National Security, LLC, [LANS]) have instituted waste management and environmental restoration programs at LANL to change these historical waste disposal practices and to clean up legacy site contamination. DOE and NNSA have recognized the need to be better stewards of the environment for future generations, while also meeting the

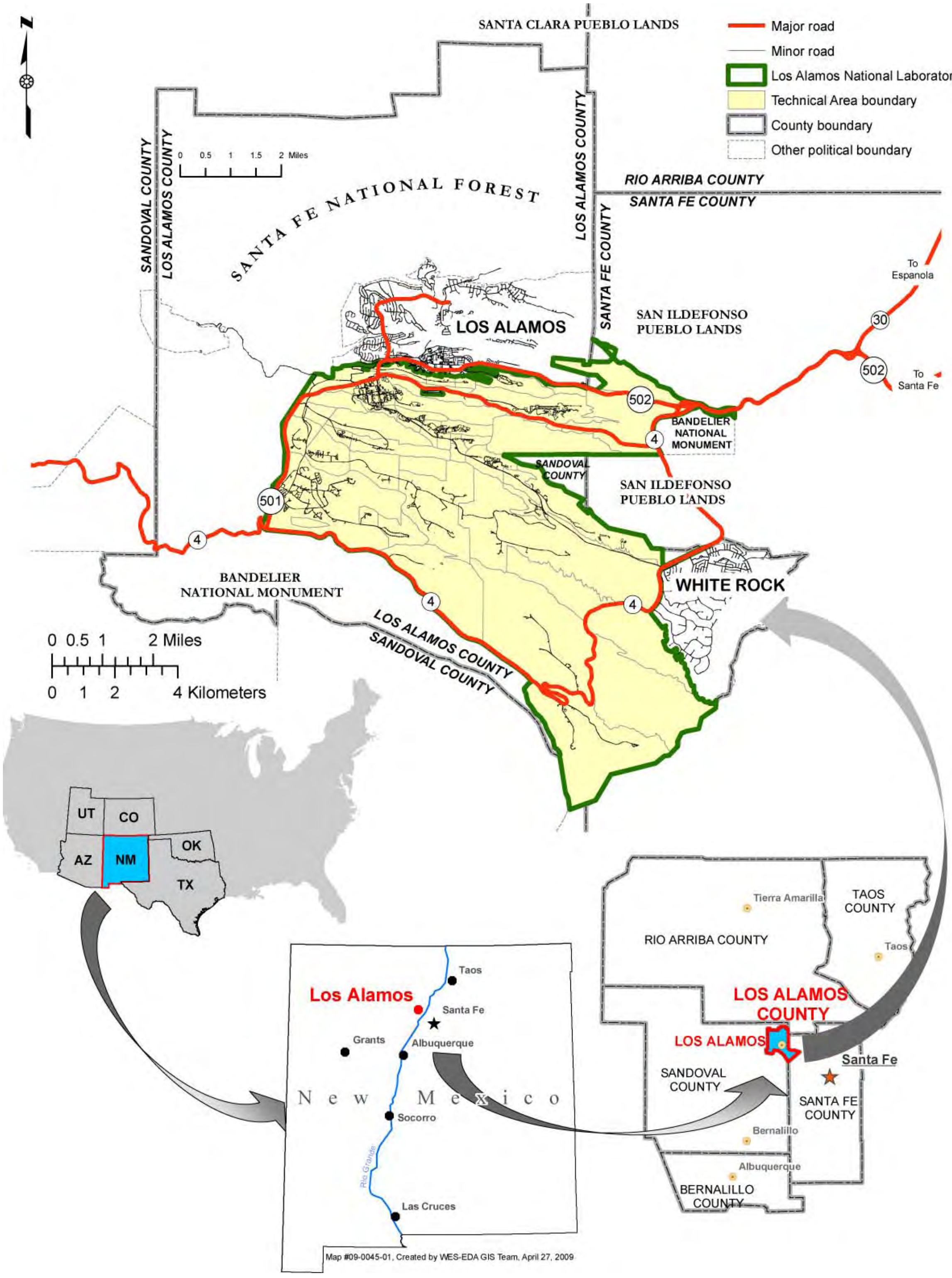

Figure 1-1 Location of Los Alamos National Laboratory Site

requirements of a variety of applicable federal and state environmental laws and regulations as well as DOE orders and directives. The U.S. Environmental Protection Agency (EPA) and the New Mexico Environment Department (NMED) are the principal administrative authorities for these laws.

In March 2005, NMED, the State of New Mexico Attorney General, DOE, and the University of California (as the former LANL management and operations contractor) entered into a *Compliance Order on Consent* (Consent Order) (NMED 2005) that is currently being implemented to address the investigation and remediation of environmental contamination at LANL. Investigations are being conducted in Sandia Canyon under NMED-approved work plans. The Investigation Report for the Sandia Canyon watershed was submitted to NMED on October 15, 2009, and NMED approved the report, with modification, on February 10, 2010. With regard to reach S-2, NMED has required DOE and LANS to perform a geophysical survey of the subsurface beneath the wetland. DOE and LANS must submit a Phase II Investigation Report. Once NMED is satisfied that sufficient information has been collected, NMED will determine whether no further action is required or whether corrective measures are needed. If the latter, NMED would direct DOE to conduct a corrective measures evaluation to identify and evaluate alternatives for final remediation. If necessary to prevent migration of contaminants or control unacceptable exposure while long-term corrective measures are evaluated and implemented, interim measures may be performed as directed by NMED or as proposed by DOE and approved by NMED. Emergency interim measures may be implemented without prior NMED approval.

As needed and as directed by NMED, alternative corrective measures may be evaluated. After NMED selects the corrective measures, these measures are implemented and then documented upon completion. Activities to be performed in compliance with the Consent Order are similar to those that have taken place for years at LANL (such as drilling exploratory wells or performing contaminated soil removals), but the timing and extent of some activities may be different from those previously anticipated. Regardless of the alternative for expansion of the SERF that is selected by NNSA, appropriate actions will be taken to investigate and appropriately remediate contaminated sediment in the Sandia Canyon watershed under the provisions of the Consent Order.

Environmental stewardship at LANL is targeted at reducing sources of wastewater and reusing treated effluent to reduce the number of industrial outfalls that discharge to the environment from current operations. LANL's environmental stewardship also focuses on implementing natural resource conservation measures to reduce the consumption of potable water and other natural resources, and protecting the biological and cultural resources and attributes present at LANL.

1.3 PURPOSE AND NEED

NNSA is now considering how to address more stringent effluent limitations for LANL wastewater discharges. Specifically, NNSA needs to take action at LANL to improve wastewater treatment to attain state water quality standards-based, final effluent limitations for PCBs imposed in National Pollutant Discharge Elimination System (NPDES) Permit NM0028355 (effective August 1, 2007). The permit requires compliance with these limitations by July 30, 2012.

Additionally, NNSA must take action at LANL to meet internal DOE orders and goals to reduce the amount of potable water used by LANL's industrial operations. The purpose of this conservation measure is to enhance the environmental stewardship of this natural resource in recognition of the limited amount of available groundwater present in the New Mexico desert environment, a growing regional population and its increasing groundwater consumption demands, and the decade-long, region-wide drought conditions in the southwestern United States (U.S.). Wherever possible and practicable, NNSA is trying to find ways to reuse water that would otherwise be discharged to the environment.

At the same time, DOE is addressing environmental restoration requirements related to legacy contaminants present within the upper Sandia Canyon watershed at LANL as a result of past LANL operational practices. Specifically, DOE needs to address the environmental contamination present within the area of Sandia Canyon designated as reach S-2 (Figure 1-2) in accordance with the Consent Order for site contamination investigation and remediation, and in furtherance of its compliance with other state and national laws and regulations.

In meeting these needs and purposes for taking various actions, DOE and NNSA must also manage the natural resources present at LANL. NNSA has an ongoing responsibility to derive overall maximum ecological benefit from its actions with minimal adverse effects from LANL operations, and to further its on-going compliance with applicable laws, regulations, orders, and other legal requirements.

1.4 Related DOE and NNSA NEPA Compliance Documents

Dual Axis Radiographic Hydrodynamic Test Facility Final Environmental Impact Statement (DOE/EIS-0228) (DOE 1995)

Environmental Assessment for Effluent Reduction, Los Alamos National Laboratory, New Mexico (DOE/EA-1156) (DOE 1996)

Environmental Assessment for the Proposed Strategic Computing Complex at Los Alamos National Laboratory, Los Alamos, New Mexico (DOE/EA-1250) (DOE 1998)

Site-Wide Environmental Impact Statement for Continued Operation of the Los Alamos National Laboratory (DOE/EIS-0238) (DOE 1999a)

Final Environmental Impact Statement for the Conveyance and Transfer of Certain Land Tracts Administered by the U.S. Department of Energy and Located at Los Alamos National Laboratory, Los Alamos and Santa Fe Counties, New Mexico (DOE/EIS-0293) (DOE 1999b)

Categorical Exclusion Determination for the Cooling Tower Water Conservation Project, Accession No. 8544 (LAN-02-003) (LANL 2001a).

Final Site-Wide Environmental Impact Statement for Continued Operation of Los Alamos National Laboratory (DOE-EIS-0380) (DOE 2008)

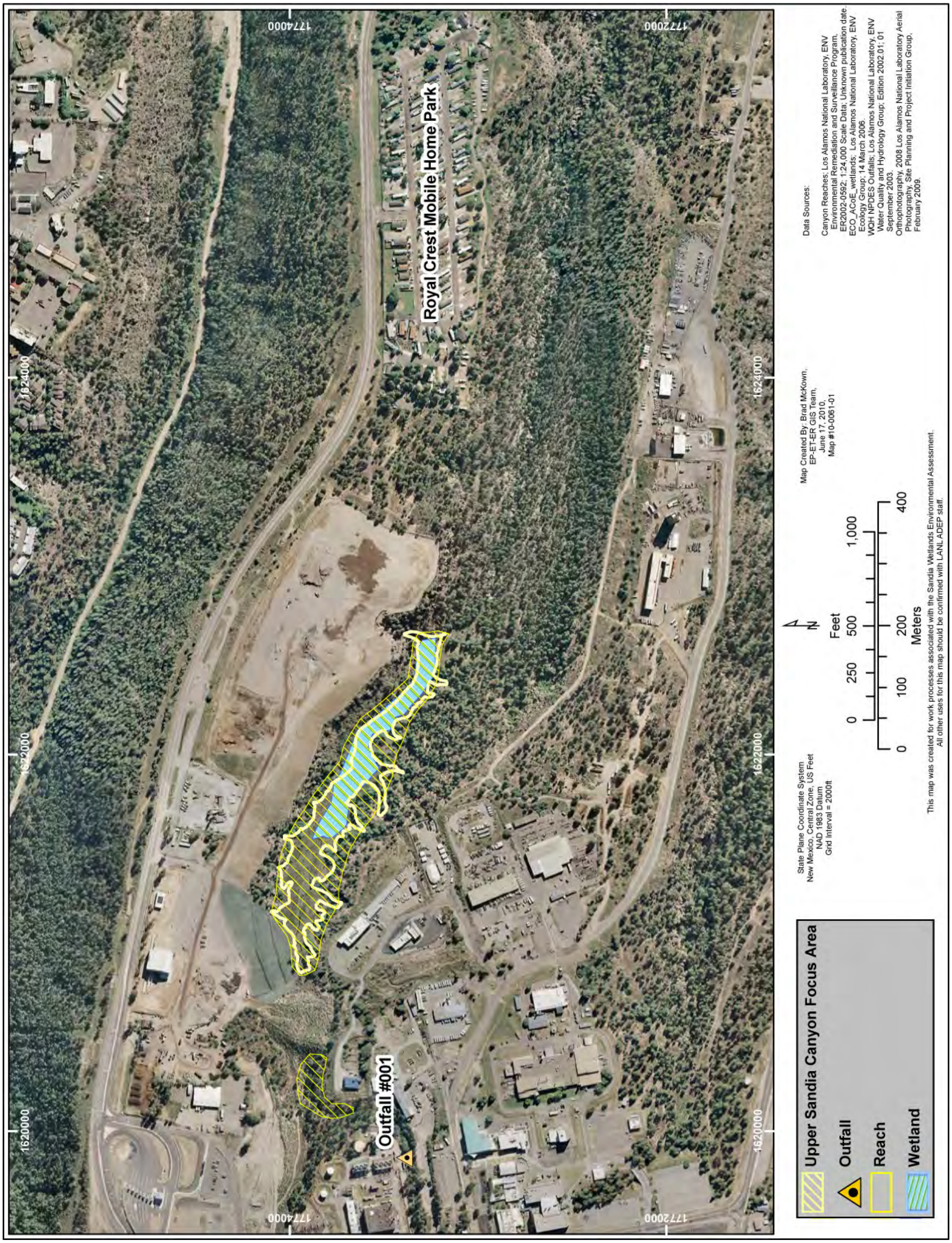

Figure 1-2 Upper Sandia Canyon Focus Area

1.5 ENVIRONMENTAL ASSESSMENT METHODOLOGY

A sliding-scale approach (DOE 2004) is the basis for the analysis of potential environmental and socioeconomic effects in this EA. That is, certain aspects of the proposed actions have a greater potential for creating environmental effects than others; therefore, they are discussed in greater detail in this EA than those aspects of the actions that have little potential for effect. For example, implementation of the proposed actions could affect a wetland resource in Sandia Canyon. This EA, therefore, presents in-depth descriptive information about this resource to the fullest extent necessary for effects analysis. On the other hand, implementation of the proposed actions would cause only a minor effect on socioeconomics at LANL. This EA, therefore, presents a minimal description of socioeconomic effects.

When details about proposed actions are incomplete, as most are for the possible environmental restoration activities evaluated in this EA, a bounding analysis is often used to assess potential effects. For example, the Consent Order requires investigations within canyon watersheds in accordance with approved work plans. These investigations and work plans may lead, as approved by NMED, to remedial corrective measure actions. The need for and scope of corrective measures for the Sandia Canyon watershed have not yet been determined. Therefore, it is not yet possible to describe the specific details for environmental restoration measure(s), if any, that would be implemented within reach S-2.

For this reason, a bounding analysis will be used to evaluate possible impacts in order to facilitate DOE's overall compliance with the Consent Order. This bounding analysis approach makes reasonable maximum assumptions regarding potential emissions, effluents, waste streams, and project activities (see Sections 2.0 and 4.0 of the EA). Such an analysis usually provides an overestimation of potential effects. In addition, any proposed future action(s) that exceeds the assumptions—the bounds of this effects analysis—would not be allowed until completing an additional NEPA review. At that point, a decision to proceed or not with the action(s) could be made.

1.6 PUBLIC INVOLVEMENT

On March 4, 2010, NNSA provided written notification of this NEPA review to the State of New Mexico, the four Accord Pueblos—San Ildefonso, Santa Clara, Jemez, and Cochiti—the Mescalero Apache Tribe, and to over 30 stakeholders in the area. Then on March 24, 2010, NNSA held a public scoping meeting in Los Alamos to provide information about the two projects and to provide a forum for public comment on the scoping of the EA.

Beginning on the date of the release of the draft EA, draft FONSI, and draft Mitigation Action Plan, NNSA provided stakeholders with a 30-day comment period. The hearing on the draft document was held on July 27, 2010, from 2 to 4 p.m., at the Holiday Inn Express, Los Alamos, New Mexico. Concerns and comments on the draft EA are addressed in this document where appropriate and to the extent practicable.

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CHAPTER 2

2.0 DESCRIPTION OF ALTERNATIVES

2.1 INTRODUCTION

This EA considers two separate actions, the expansion of the SERF and environmental restoration of reach S-2, that would take place adjacent to or within upper Sandia Canyon at LANL. The primary focus area of the upper end of Sandia Canyon extends from Outfall 001 to the eastern end of reach S-2 (Figure 1-2).

The two action alternatives considered for the SERF project each include the expansion of the existing facility and the distribution of treated effluent as makeup water for LANL facilities located within TA-3. Each action alternative would also affect the discharges via NPDES outfalls located along the southern rim of Sandia Canyon. The two SERF expansion alternatives differ with regard to the amount of treated effluent reused as cooling tower and boiler makeup water and the amount of treated effluent that could be discharged to the environment.

Two environmental restoration activity alternatives are also considered in this EA that would involve actions located along the canyon bottom within reach S-2 of Sandia Canyon, which begins at the eastern boundary of TA-3 and extends for about 2,500 ft (700 m) along the shared TA-60 and TA-61 boundaries. Surface water flows from the outfall discharge points in an easterly direction across reach S-2 and then extends downstream about 2.5 miles (4 km) before infiltrating into canyon sediments.

This chapter of the EA includes descriptions in general terms of the proposed action alternatives for the SERF and potential environmental restoration action measures that may be implemented for reach S-2. It also describes the No Action Alternatives for each action. For the SERF, the No Action Alternative would be the use of the existing SERF to treat a limited amount of sanitary effluent for reuse without any structural enlargement or addition of extra equipment, storage tanks, or other pumps or piping structures. For the environmental restoration action measures in reach S-2, the No Action Alternative would be the status quo with no additional stabilization measures or soil removal actions performed. All appropriate and pertinent permits and regulatory requirements would be obtained or met prior to undertaking either action.

These two separate actions—the SERF expansion proposed action alternatives and the potential environmental restoration action measures—will have different decision makers. NNSA will make a decision among the alternatives analyzed for the SERF. NMED will make the decision(s) for environmental restoration of reach S-2 under the provisions of the Consent Order and then DOE will make associated implementing decisions for the environmental restoration actions selected by NMED.

Because these separate actions potentially affect a common geographical location (reach S-2) and may have overlapping time frames, NNSA has chosen to consider both actions in the same EA. Each separate action has the potential to result in direct, indirect, and cumulative environmental impacts that could affect a common set of natural resources and receptors located nearby and within the upper reaches of Sandia Canyon. Given the different regulatory goals that each decision maker will address, as well as the potential environmental impacts and other decision making elements, a combination of different actions may be implemented.

Table 2-1 identifies the separate alternatives that are analyzed in this EA for each of the two actions, and the different possible combinations of alternatives that could be selected for implementation by the two different decision entities.

Table 2-1. Possible Combinations of Alternatives

SERF No Action[1]	SERF No Action[1]	SERF No Action[1]	SERF Partial Reuse[2]	SERF Partial Reuse[2]	SERF Partial Reuse[2]	SERF Total Reuse[3]	SERF Total Reuse[3]	SERF Total Reuse[3]
Reach S-2 No Action[4]	Reach S-2 Stabilization In Place with Long-Term Monitoring[5]	Reach S-2 Removal and Off-Site Disposal[6]	Reach S-2 No Action[4]	Reach S-2 Stabilization In Place with Long-Term Monitoring[5]	Reach S-2 Removal and Off-Site Disposal[6]	Reach S-2 No Action[4]	Reach S-2 Stabilization In Place with Long-Term Monitoring[5]	Reach S-2 Removal and Off-Site Disposal[6]

1 See Section 2.
2 See Section 2.5.1
3 See Section 2.5.2
4 See Section 2.5.1
5 See Section 2.7.1
6 See Section 2.7.2.

Later in this EA at the end of Chapter 4, the impacts of the six alternatives are presented in a table of summary level information pulled from the text presented in that chapter, and the impacts of these nine possible combinations of alternatives that could be selected for implementation may be viewed together. Additional future NEPA environmental assessment reviews may be deemed necessary if this EA analysis does not adequately address potential impacts from actions ultimately selected by NMED for environmental restoration action measures in reach S-2. SERF action alternatives or environmental restoration options that were considered, but dismissed from further analysis in this EA, are presented at the end of this chapter.

2.2 National Pollutant Discharge Elimination System Regulatory Compliance

> The LANL NPDES permit is available on the web.
> http://www.lanl.gov/environment/h2o/docs/NM0028355_NPDESPermitMod_070717.pdf

The goal of the *Clean Water Act* is to restore and maintain the chemical, physical, and biological integrity of the nation's waters. The regulations specify water quality standards and effluent limitations. To comply with the *Clean Water Act*, LANL has two primary programs—the NPDES permit program and the Spill Prevention Control and Countermeasure (SPCC) Program. A single, site-wide NPDES permit covers industrial and sanitary effluent discharges at LANL. EPA Region 6, located in Dallas, Texas, issued and enforces the permit. However, NMED performs some compliance evaluation inspections and monitoring for the EPA through a water quality grant issued under Section 106 of the *Clean Water Act*. The NPDES permit specifies the parameters measured and the sampling frequency for the outfalls located around LANL.

2.3 Outfall Reduction Compliance

Since 1993, DOE has undertaken efforts to enhance the treatment of wastewater effluent and to reduce the number of sanitary and industrial wastewater discharges and outfalls. These efforts strive to meet the overall target goal of achieving zero liquid discharge from LANL operations by 2012 (LANL 2007a). At the end of 2008, these efforts resulted in the elimination of about 125 outfalls. To meet the mid-1990s requirements of the NPDES permit, LANL personnel initiated a feasibility study to consider the elimination of outfalls and the addition of various treatment technologies.

In 1996, DOE proposed activities to eliminate the industrial effluent discharged from 27 LANL outfalls and to reroute industrial effluent away from another 14 outfalls. The proposed activities, which ranged in complexity from removing sinks and floor drains within buildings to digging trenches and adding new pipelines both indoors and outdoors, were considered in DOE's *Environmental Assessment for Effluent Reduction* (DOE/EA-1156), which DOE issued along with a Finding of No Significant Impact in September 1996 (DOE 1996).

Between 1997 and 2008, a total of 40 industrial or sanitary waste outfalls were removed from service as a result of the efforts to reroute and consolidate flows and eliminate outfalls. LANL's 2007 industrial point-source NPDES permit includes 15 permitted outfalls—one of the outfalls was a sanitary outfall and the remaining 14 were outfalls from industrial operations (Table 2-2). Five canyons that previously received LANL discharges are no longer receiving any industrial effluent. Sandia Canyon is one of the four remaining watersheds where outfalls continue to discharge industrial and sanitary effluent (DOE 2008).

Table 2-2. Volume of Effluent Discharge from NPDES-Permitted Outfalls in 2008

Outfall Number	TA-Bldg	Description	Watershed (Canyon)	2008 Discharge (gal.)
02A129	21-357	TA-21 Steam Plant	Los Alamos	0
03A048	53-963/978	LANSCE[1] Cooling Tower	Los Alamos	18,236,300
051	50-1	TA-50 Radioactive Liquid Waste Treatment Facility	Mortandad	1,397,265
03A021	3-29	CMR Building Air Washers	Mortandad	172,800
03A022	3-2238	Sigma Cooling Tower	Mortandad	296,640
03A160	35-124	National High Magnetic Field Laboratory Cooling Tower	Mortandad	101,560
03A181	55-6	Plutonium Facility Cooling Tower	Mortandad	235,123
13S[2]	46-347	SWWS Plant	Sandia	101,276,290
001	3-22	Power Plant	Sandia	14,790,915
03A027	3-2327	Strategic Computing Complex Cooling Tower	Sandia	11,465,780
03A113	53-293/952	LEDA[3] Cooling Tower	Sandia	387,305
03A199	3-1837	Laboratory Data Communications Center	Sandia	9,225,860
03A130	11-30	TA-11 Cooling Tower	Water	2,628
03A185	15-312	DARHT[4] Cooling Tower	Water	823,136
05A055	16-1508	High Explosives Wastewater Treatment Facility	Water	0
			2008 TOTAL EFFLUENT DISCHARGES	158,411,602

Source: LANL 2009a

[1] Los Alamos Neutron Science Center

[2] Outfall 13S is an internal outfall at the TA-46 SWWS Plant and is located after the chlorine contact chamber. From Outfall 13S, wastewater is permitted to be pumped up to the Reuse Tank for use at the Power Plant and then through Outfall 001 to Sandia Canyon at TA-3.

[3] Low-Energy Demonstration Accelerator

[4] Dual Axis Radiographic Hydrodynamic Testing facility

Three existing outfalls at the upper reach of Sandia Canyon accounted for 137 million gal./yr (519 million L/yr) in 2008. The single largest wastewater discharge at LANL is from Outfall 001. Treated sanitary wastewater effluent from the TA-46 Sanitary Wastewater Systems (SWWS) Plant accounts for the majority of the Outfall 001 effluent volume, measuring 101 million gal. (382 million L) in 2008. Boiler water blowdown from the TA-3 Power Plant added an additional 15 million gal. (57 million L) to the Outfall 001 effluent volume in 2008. (Blowdown is a term that describes wastewater actually produced from the evaporative water use process to remove suspended particles and reduce the buildup of solids.) Cooling tower blowdown from the TA-3 Nicholas C. Metropolis Center for Modeling and Simulation, also known as the Strategic Computing Complex (SCC) or the Metropolis Center, and blowdown from the Laboratory Data Communications Center (LDCC) discharge the balance of the effluent into the upper reach of Sandia Canyon via Outfalls 03A027 and 03A199, respectively (LANL 2009a).

In 2007, LANL initiated an NPDES permit compliance strategy (also called the Outfall Reduction Strategy) with the objective of meeting the stricter effluent discharge requirements in the NPDES permit and potable water conservation goals. A feasibility study to assess treatment options categorized the remaining 15 LANL outfalls into six outfall groups.

Outfall Group 1 consists of Outfalls 13S, 001, 03A027, and 03A199. This group represents approximately 86 percent of the total discharge in 2008 from NPDES-permitted outfalls at LANL. The recommendation of the feasibility study for Outfall Group 1 was to expand the treatment capacity of the SERF from 100,000 to 400,000 gal./d (379,000 to 1.514 million L/d) to treat SWWS Plant effluent, the cooling tower blowdown from SCC and LDCC, and the cooling tower blowdown and boiler water blowdown from the TA-3 Power Plant. The expansion would include additional treatment equipment to allow the treated product water to meet the stricter NPDES effluent limitation for PCBs (LANL 2007a). The NPDES permit effluent limit for PCBs at Outfall 001 is 0.00064 µg/L (0.64 parts per trillion). The study recommendations for Outfall Group 1 are incorporated in the SERF expansion alternatives and are analyzed in this EA. The remaining five outfall groups are not covered under this EA; however, the current status of the Outfall Reduction Strategy for these NPDES outfalls is discussed in the following paragraphs.

Outfall Group 2 includes the TA-50 Radioactive Liquid Waste Treatment Facility (RLWTF) (Outfall 051), the TA-55 Plutonium Facility cooling towers (Outfall 03A181), and the TA-35 National High Magnetic Field Laboratory cooling tower (Outfall 03A160). These discharges account for only one percent of the total flow and would likely continue; however, eventually the RLWTF discharge will be rerouted to evaporative tanks to eliminate Outfall 051 (DOE/EIS-0380 2008 and 2009 RODs). The TA-35 and TA-55 cooling towers could eventually be routed to the SERF, thereby eliminating Outfalls 03A160 and 03A181.

Outfall Group 3 includes the LANSCE and LEDA cooling towers at TA-53 (Outfalls 03A048 and 03A113), which account for over 11 percent of the LANL discharge volume. Studies to eliminate these discharges are underway that would use evaporation ponds.

Outfall Group 4 consists of the Chemistry and Metallurgy Research (CMR) building air washers and the Sigma Complex cooling tower (Outfalls 03A021 and 03A022, respectively). The CMR air washers have been rerouted to the SWWS Plant and Outfall 03A021 will be removed from the NPDES permit. The Sigma Complex cooling tower could continue to discharge via Outfall

03A022 because its effluent would meet the newer effluent quality requirements. Effluent from Outfall 03A022 could also eventually be piped to the SERF.

Outfall Group 5 is the DARHT cooling tower at TA-15, which discharged over 800,000 gal. (3,032,000 L) to Water Canyon in 2008. Planning is complete and execution is underway for rerouting DARHT cooling tower blowdown to the SWWS Plant and removing Outfall 03A185 from the permit.

Outfall Group 6 includes the remaining miscellaneous discharges from the TA-21 Steam Plant (Outfall 02A129), the TA-11 Vibration Facility cooling tower (Outfall 03A130), and the TA-16 High Explosives Wastewater Treatment Facility (HEWTF) (Outfall 05A55). Because discharge from the TA-21 Steam Plant was eliminated in September 2007 and the plant is scheduled for decommissioning and demolition in 2010, Outfall 02A129 will be eliminated from the permit. The TA-11 cooling tower discharge has been rerouted to an evaporative tank. The HEWTF has installed upgrades to operate as a zero liquid discharge facility (LANL 2007a, Wingo 2010a).

2.4 EXECUTIVE ORDER 13514, FEDERAL LEADERSHIP IN ENVIRONMENTAL, ENERGY, AND ECONOMIC PERFORMANCE

Executive Order 13514, Federal Leadership in Environmental, Energy, and Economic Performance, sets a goal of 26 percent potable water use reduction over fiscal year 2007 usage levels by 2020 for all federal facilities. Cooling towers at LANL facilities use from 60 to 90 percent of the potable water consumed at LANL, equivalent to about 325 million gal./yr (1,230 million L/yr). Approximately 50 percent of the water is returned to the environment as cooling tower blowdown containing concentrated antibacterial and antiscaling chemical additives and natural constituents found in the groundwater supply (Wingo 2010b). Reducing the use of potable water in cooling towers is recognized as an excellent opportunity to demonstrate LANL’s and NNSA’s responsible environmental ethic and to help meet potable water reduction goals.

2.5 NO ACTION: SANITARY EFFLUENT RECLAMATION FACILITY

In November 2003, NNSA completed construction of the SERF at TA-3 along the southern rim of Sandia Canyon (Figure 2-1). The purpose of the SERF was to provide additional treatment to a portion of the SWWS Plant effluent for reuse in the SCC cooling towers. In the 1998 *Environmental Assessment for the Proposed Strategic Computing Complex* (DOE/EA-1250), DOE committed to operating the SCC with no net increase in potable water usage at LANL by substituting treated sanitary effluent for potable water (DOE 1998). The current water demands of the SCC average about 48,000 gal./d (182, 000 L/d) up to a maximum of 117,000 gal./d (443,000 L/d). The SERF is operational but has not fully operated yet; currently, safety and health modifications are being made to the facility to enhance operator safety measures and these will be completed by mid-2010, and the facility is scheduled to be fully operating before the end of 2010. Until SERF is fully operating, the subject waste waters are being released via Outfall 001 without being treated by SERF.

The SERF houses an advanced treatment system designed to remove dissolved silica (also known as the dioxide form of silicon, the principal component of sand) and total dissolved solids from the treated sanitary wastewater effluent produced by LANL’s SWWS Plant (Figure 2-2).

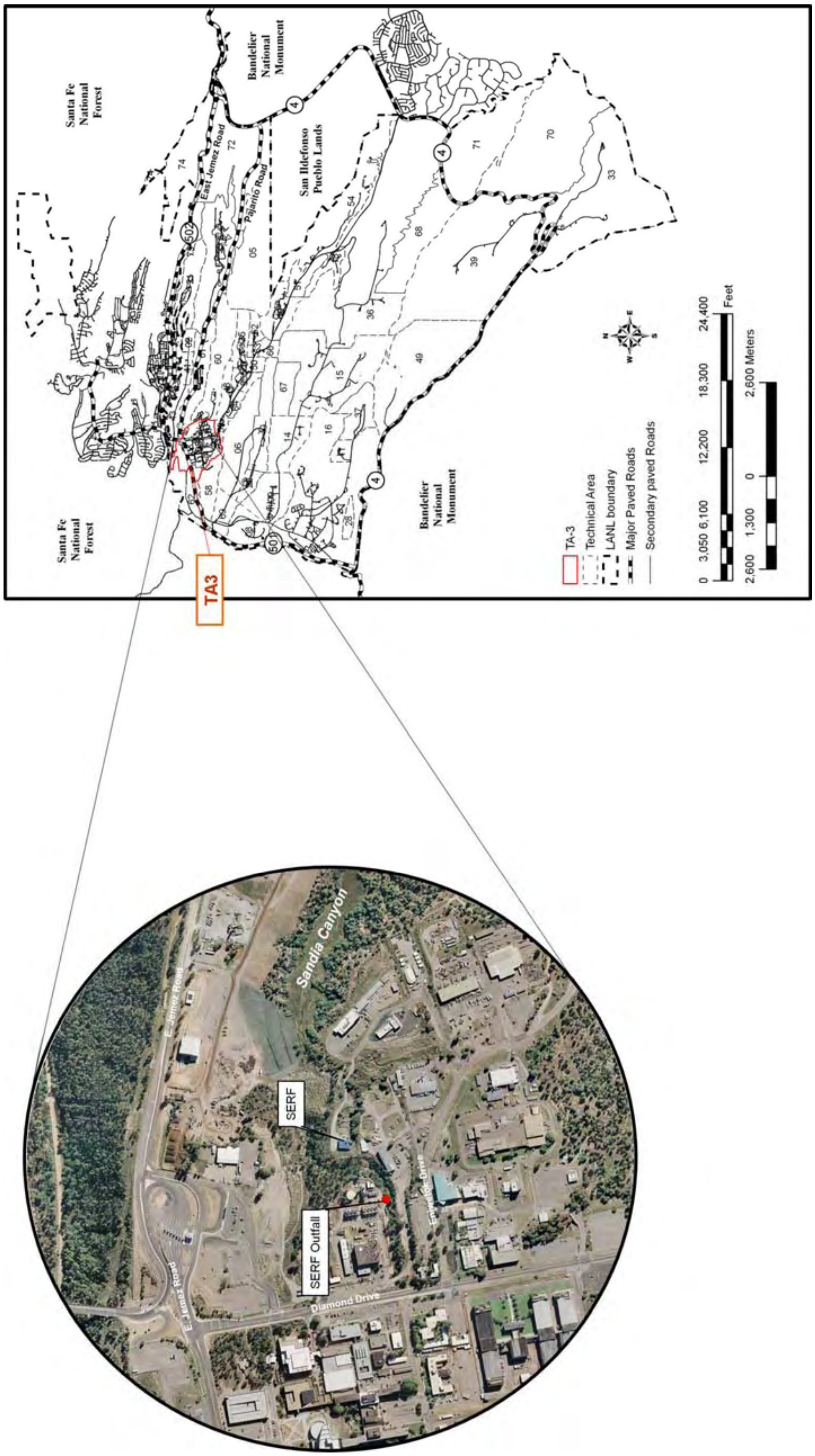

Figure 2-1 Geographic Orientation of LANL TAs and the SERF

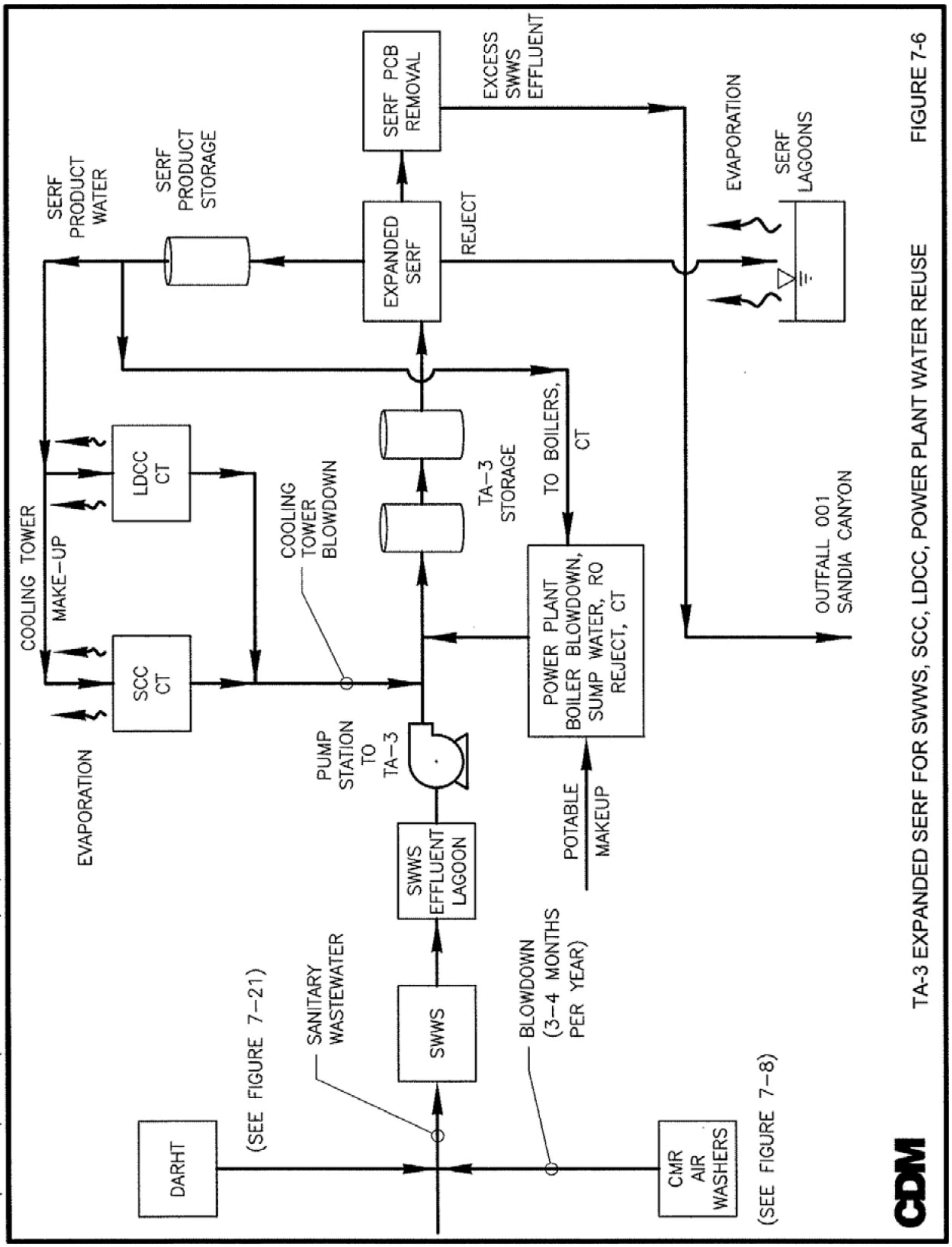

Figure 2-2 Expanded SERF Plant Flow Schematic

Source: LANL 2007a

The SERF treatment system uses chemical precipitation, gravity settling of precipitates, microfiltration, and reverse osmosis (RO) technologies to lower the silica concentrations in the wastewater. The higher silica concentration creates operational problems in the SCC cooling towers that require the replacement of the cooling water volumes after only 2 to 2.5 cycles of concentration. The SERF treatment technologies provide makeup water with lower total dissolved solids (primarily lower silica), allowing an expected 4 to 6 cycles of concentration for more efficient reuse of the treated effluent in cooling towers that would otherwise require the use of potable water.

The SERF was constructed to treat approximately one third, or 100,000 gal./d (379,000 L/d), of the SWWS Plant effluent. The treated product water from SERF will be back-blended with SWWS Plant effluent at about a 2 to 1 ratio, and then the blended wastewater will be pumped to the TA-3 cooling towers serving the SCC. The SCC cooling towers can re-circulate the blended wastewater through about 4 cycles as it evaporates. Approximately 8,400 gal./d (31,797 L/d) of concentrated reject wastewater from the SERF RO treatment process will be piped to a double-lined, solar evaporation basin located at the end of Sigma Mesa in TA-60 (Figure 2-3). The water will be evaporated at the basin, leaving a minimal film of solid waste particles. The concentrated solids from the chemical precipitation and gravity settling operations will be dewatered in a filter press and then disposed of at a licensed solid waste landfill (LANL 2004a).

Under the No Action Alternative, the SERF expansion would not be implemented and the existing SERF facility would be operated, as previously described, to treat approximately 100,000 gal./d (378,541 L/d) of the SWWS Plant effluent. The treated effluent would then be reused at the SCC to meet a portion of the potable water demands at that facility. Intermittent discharges of Power Plant cooling tower blowdown would be blended and stored with SERF product water to meet NPDES permit limits for temperature prior to discharge through Outfall 001. The remainder of the SWWS Plant effluent, without undergoing enhanced SERF treatment, would continue to be discharged to Sandia Canyon via Outfall 001. NPDES effluent limitations for PCBs would not be met and LANL would be in violation of its NPDES permit and subject to fines, or NNSA and LANS would need to renegotiate the permit. LANS would not meet the intent of E.O. 13514 relating to water conservation, or NNSA potable water reduction goals.

2.6 PROPOSED ACTION ALTERNATIVES FOR THE EXPANDED SERF

As mentioned earlier in this chapter, the two action alternatives considered for the SERF each include the expansion of the existing facility and the distribution of treated effluent as cooling tower and boiler makeup water to LANL facilities located within TA-3. The differences between the action alternatives include the operational treatment capacity and the amount of treated effluent that could be discharged into the environment. The common elements of the SERF facility expansion for both action alternatives are discussed in the following paragraphs, and the subsections that follow identify the different activities for the two alternatives.

The footprint of the SERF facility would be physically expanded by about 2,000 ft^2 (180 m^2) to house additional treatment equipment. This represents an increase of approximately 50 percent of the floor area available within the existing SERF building. New microfiltration and reverse osmosis units would be installed in the building to increase treatment capacity, and the capability to add powdered activated carbon to the coagulation process, if needed, would be included for PCB removal. Piping, lift stations, and other appurtenances would be installed to convey cooling

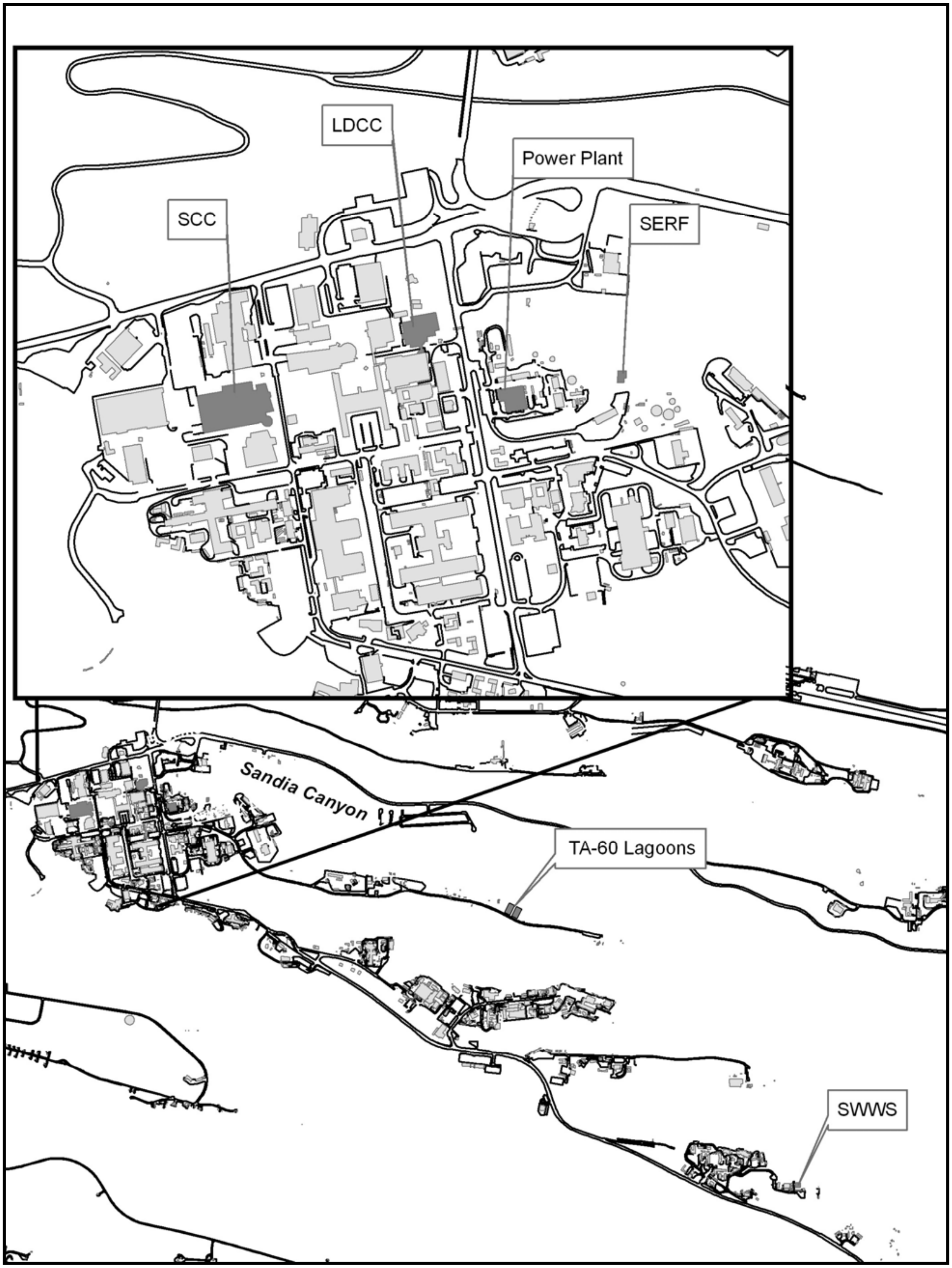

Figure 2-3 Major Facilities Involved in the SERF Expansion Project

tower blowdown from SCC and LDCC to the SERF. Boiler blowdown, cooling tower blowdown, sump drainage, and RO reject wastes from the Power Plant would also be conveyed to the SERF system for treatment.

The estimated length of new distribution piping would be up to 2,000 linear ft (610 m) (Figure 2-4). Additional evaporation capacity for the two-fold increase in the RO reject wastes would be necessary and the action would include doubling the size of the two existing evaporation ponds associated with SERF operations that are located on Sigma Mesa. Two or three additional storage tanks would also be constructed at the SERF to balance flows. These tanks would each be about 40 ft (12 m) in diameter by 40 ft (12 m) high and would hold about 500,000-gal. (1,893,000 L) of product water. An additional 800,000-gal. (3,032,000 L) storage tank, or a lagoon of equivalent capacity, would be constructed near the present lagoon at the TA-46 SWWS Plant to hold SWWS effluent. The holding tanks would be constructed of non-reflective materials or coatings, such as non-metallic tan or green paint in a matte finish, that would mimic the colors of surrounding vegetation to mitigate visual effects.

The sites proposed for installation of storage tanks at the SERF are situated in the Upper Sandia Canyon Aggregate Area and include legacy sludge drying beds designated as solid waste management units (SWMUs). A first phase of investigation of these SWMUs under the Consent Order has been completed. Before installing the proposed tanks, additional investigation of these SWMUs would be implemented to define the nature and extent of any potential contamination and to complete corrective actions under the Consent Order.

Expansion of the SERF would require about 12 to 16 construction workers over a period of approximately 14 months. Construction work would be conducted weekdays from 7 a.m. to 5 p.m. This work would include the use of heavy equipment such as cranes, forklifts, backhoes, cement trucks, and other similar construction equipment. The work would also require the use of a variety of hand tools and equipment. Noise at the site would be audible primarily to the involved workers and to workers in the immediate vicinity of the SERF project site. Involved site workers would be required to wear appropriate personal protective equipment (PPE), including hearing protection, steel-toed boots, hard hats, and other PPE as necessary. Vehicles would operate primarily during daylight hours and would be left on-site overnight. Construction equipment would be well-maintained and kept as quiet as reasonably possible.

During the construction phase, about 1.5 acres (0.6 hectares) of space in the immediate SERF vicinity would be available for equipment storage and material staging. Temporary parking areas, staging areas, laydown yards, and construction access roads may be established during the construction phases.

Ground disturbance and selective clearing of vegetation within the designated construction sites would be limited to those areas necessary to accommodate structure placement, staging areas, access roads, and distribution pipelines. Trees located within the construction sites would be removed, but large-scale clearing of vegetation is not anticipated. Following the construction of the expanded SERF and its ancillary structures, disturbed areas would be reseeded with an appropriate seed mix to stabilize the topsoil, and re-vegetation efforts would be monitored and areas reseeded as appropriate to ensure adequate coverage to control erosion.

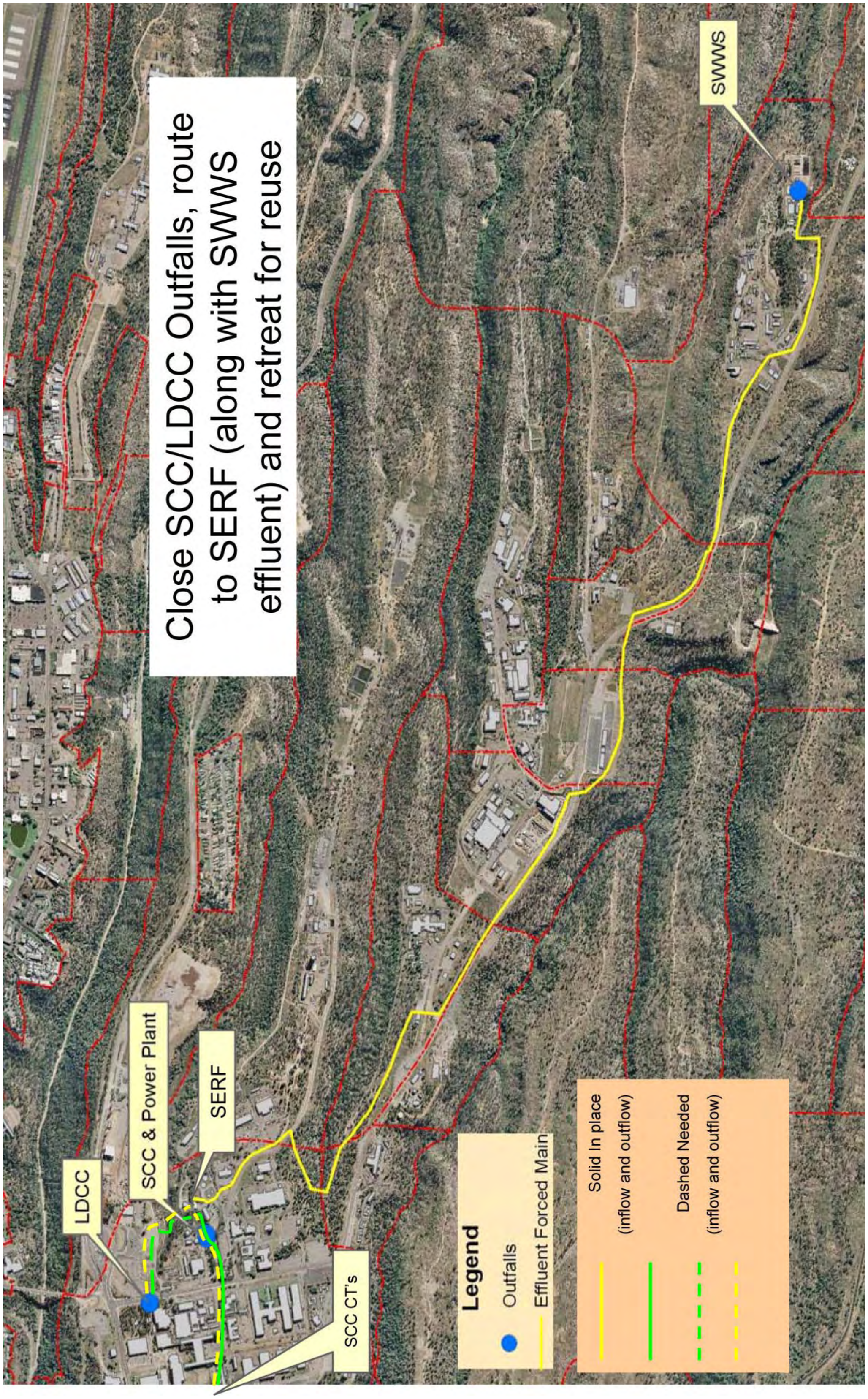

Figure 2-4 Piping System for the Existing and the Expanded SERF

Best management practices (BMPs) for soil erosion control, such as the use of water sprays or chemical soil tackifiers[2], would be implemented during construction activities at the SERF location and at the evaporation ponds on Sigma Mesa. BMPs could include run-on and runoff controls, such as the use of silt fencing, ditching, straw bales, and similar stormwater flow controls. Construction activities are handled under the Laboratory's Storm Water General Permit Program. An NPDES Notice of Intent would be filed. A Storm Water Pollution Prevention Plan (SWPPP) would be required for all SERF construction activities involving soil disturbance.

Construction and maintenance activities would be avoided or curtailed in areas where federally-designated threatened and endangered (T&E) species occur, particularly during nesting seasons.

Habitat disturbance would be both temporary and minimal at the SERF construction site, but at the lagoon construction site, the removal of mature trees would result in a permanent elimination of about two acres (0.8 hectares) of potential mesa-top core habitat. Construction and maintenance activities would be monitored by a trained biologist to ensure that federally-listed threatened and endangered species would not be adversely affected.

If any archaeological sites are inadvertently discovered during construction, these sites would be documented and evaluated for National Register of Historic Places (NRHP) eligibility. If NRHP eligibility status has not been determined, project impacts to unevaluated and/or potentially eligible cultural resources may be significant. When documented and evaluated through consultation with the SHPO, adverse impacts to NRHP-eligible and -listed cultural resources would be avoided and, if avoidance is not possible, mitigation of adverse effects would be required.

2.6.1 Action Alternative—Partial Reuse

Under the Partial Reuse Alternative, the SERF would be expanded to an operational treatment capacity of approximately 400,000 gal./d (1.514 million L/d). The expanded treatment capacity would allow the SERF to treat 100 percent of the SWWS Plant effluent to meet NPDES discharge limits for Outfall 001 and also to treat SCC and LDCC cooling tower blowdown. Boiler blowdown, cooling tower blowdown, sump drainage, and RO reject wastes from the Power Plant would also be treated at the expanded SERF. Distribution piping would be installed to connect the facilities. SERF product water would be used only in the SCC cooling towers; the LDCC cooling towers would continue in the current mode of operation. Outfall 03A027 would be combined with Outfall 001, resulting in the elimination of one NPDES outfall (LANL 2009b).

The treated effluent would be recycled to meet up to 100 per cent of the current water demands for the SCC, achieving a substantial reduction in potable water usage. To meet the water quality requirements of the SCC cooling tower, two parts SERF product water must be blended with one part SWWS Plant effluent. Therefore, the water demands of the SCC cooling towers would be met by using approximately 217,000 gal./d (821,000 L/d) of treated SERF product water blended

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[2] Tackifiers are chemical dust suppressants often added to water that act to disperse the chemicals, then evaporate after application. The chemicals that are left behind bind the soil particles together into larger particles that are less easily blown in the air.

with approximately 108,000 gal./d (409,000 L/d) of SWWS Plant effluent (Wingo 2010b; LANL 2010a, 2010b).

This action alternative would be implemented and the SERF expanded treatment capability is planned to become operational in 2012, before the July 30, 2012 compliance deadline established in the NPDES permit for achieving PCB effluent limitations. The operational reuse of treated wastewater in the SCC cooling towers would be phased in shortly thereafter. All activities that make up this action alternative would be expected to be completed by 2014.

Under this alternative, the SERF would discharge a reduced volume of effluent into upper Sandia Canyon treated to a sufficient quality to meet the NPDES effluent limitations for Outfall 001. The wastewater flows that would be treated at the expanded SERF are shown in Table 2-3. Also shown in the table is the amount of potable water currently consumed that would be replaced by the treated and blended SERF effluent and, therefore, available to meet other potable water requirements now or in the future.

Table 2-3. Discharges to be Treated at the Expanded SERF for the Partial Reuse Alternative

Current Discharge	Maximum Volume Treated (gal./d)	Potable Water Demands of TA-3 Facilities (gal./d)	Potable Water Demands Met by the Expanded SERF (gal./d)
SWWS Plant effluent	256,400		
SCC cooling tower blowdown	81,000[a]	324,000	324,000[b]
LDCC cooling tower blowdown	38,880[a]	155,520	0
Power Plant boiler blowdown	29,866	0 to 60,000	0
TOTALS	406,146	479,520 to 539,520	324,000

Source: LANL 2010a

[a] at 4 cycles of concentration

[b] 2 parts SERF product water blended with 1 part SWWS Plant effluent

Under the Partial Reuse Alternative, operating the expanded SERF to recycle SCC cooling tower blowdown to provide makeup water would reduce the discharge of treated wastewater to Sandia Canyon by up to approximately 300,000 gal./d (1,137,000 L/d) or 75 percent. Potable water demands of the TA-3 facilities would be reduced by up to 60 percent.

2.6.2 Action Alternative—Total Reuse

Under the upper bounding Total Reuse Alternative, the SERF would be expanded as previously described, and up to 100 percent of the SERF product water would be recycled for reuse at the SCC, LDCC, or the Power Plant to meet the goal of zero effluent discharge into Sandia Canyon from the SERF. The water quality requirements for the Power Plant boiler makeup are achievable using SERF effluent without blending. Both Outfall 03A027 and Outfall 03A199 would be combined with Outfall 001, resulting in the elimination of two NPDES outfalls (LANL 2009b).

About 1,000 ft (305 m) of additional distribution piping would be installed to convey treated effluent to the LDCC cooling towers and to the TA-3 Power Plant. The boiler blowdown from the Power Plant is not a routine daily wastewater discharge but occurs periodically; the boiler makeup water flow is estimated at 0 to 60,000 gal./d (0 to 227,124 L/d). The wastewater flows that would be treated at the expanded SERF are shown in Table 2-4, along with the potable water consumption replaced by SERF effluent.

Table 2-4. Discharges to be Treated at the Expanded SERF for the Total Reuse Alternative

Current Discharge	Maximum Volume Treated (gal./d)	Potable Water Demands of TA-3 Facilities (gal./d)	Potable Water Demands Met by the Expanded SERF (gal./d)
SWWS Plant effluent	256,400		
SCC cooling tower blowdown	81,000[a]	324,000	324,000[b]
LDCC cooling tower blowdown	38,880[a]	155,520	80,146
Power Plant boiler blowdown	29,866	0 to 60,000	0
TOTALS	406,146	479,520 to 539,520	406,146

Source: LANL 2010a

[a] at 4 cycles of concentration

[b] 2 parts SERF product water blended with 1 part SWWS Plant effluent

Operation of the expanded SERF to recycle 100 percent of the blowdown from the SCC, LDCC, and the Power Plant would reduce the discharge to Outfall 001 to zero, except for times when the cooling towers or boilers are shut down for periodic maintenance and temporarily reduce the demand for SERF product water. Potable water demands of the TA-3 facilities would be reduced by up to 75 percent.

As with the Partial Reuse Alternative, completion of the SERF expansion actions would be expected by 2012, with total phase-in of the distribution lines and reuse of 100 percent of the SERF effluent by 2014. Correspondingly, the phase-out of effluent discharge into reach S-2 from Outfall 001 would also be accomplished by 2014.

2.7 No Action Environmental Restoration of Reach S-2 in Sandia Canyon

The Consent Order was issued under the provisions of the *New Mexico Hazardous Waste Act* and the *New Mexico Solid Waste Act*, and contains regulatory requirements governing the scope and timing of investigations and remediation in Sandia Canyon. These requirements are discussed in more detail in the Consent Order.

> The Consent Order is available on the web.
> http://www.nmenv.state.nm.us/hwb/documents/LANL_3-1-2005_Consent_Order_Revised_6-18-2008.pdf

Under the No Action Alternative, DOE would undertake no environmental restoration activities in reach S-2. However, monitoring and investigation of site conditions and site contamination would continue as required by the Consent Order or subsequent NMED direction. Information about the existing site conditions and contamination present within reach S-2 is presented in Chapter 3, Affected Environment.

Two bounding environmental restoration activities are evaluated in this EA. NMED will ultimately determine the scope and timing of activities to be undertaken by DOE in reach S-2.

2.8 ACTION ALTERNATIVES FOR ENVIRONMENTAL RESTORATION OF REACH S-2 IN SANDIA CANYON

The two bounding action alternatives for environmental restoration activities to be conducted in accordance with the Consent Order provisions that are analyzed in this EA are Alternative 1—Stabilization in Place with Long-Term Monitoring and Alternative 2—Removal with Off-Site Disposal. Common aspects of both alternatives include the need for site workers to use appropriate PPE and follow a site-specific Health and Safety Plan. Work in Sandia Canyon would be conducted during daytime hours from 7 a.m. to 5 p.m.

Work within reach S-2 would likely require the use of heavy equipment such as cranes, forklifts, dozers, backhoes, trucks, and other similar construction equipment. The work would also necessitate the use of a variety of hand tools and equipment. Noise at the site would be audible primarily to workers involved with construction of the grade control structure. Involved site workers would be required to wear appropriate PPE, including hearing protection, and could involve the use of specialized protective clothing and breathing masks. Disturbed areas would be reseeded using appropriate native seed mixes, to the extent practicable, at the completion of construction activities.

Sediment material excavated would be sampled and characterized to determine the appropriate waste management actions. BMPs for soil erosion control would be implemented during construction activities in reach S-2. Appropriate permits would be obtained prior to either action being implemented. A one-lane access road would be constructed from the south rim of Sandia Canyon in TA-3 to the canyon near the upper end of reach S-2. The road would continue along the southern bank of reach S-2 and would end near the eastern terminus of the wetland (Figure 2-5). The access road would attempt to improve an old pipeline road that existed many years ago in the upper part of reach S-2. The access road would be approximately 1,825 ft (550 m) long and 10 to 12 ft (3 to 3.6 m) wide. Construction of the access road would involve about five to 10 workers and require approximately one month to complete.

No storage of fuels to refuel construction vehicles would be permitted within 100 feet of the 100-year floodplain. Steps would be taken to minimize any debris left in the floodplain. This includes all downed vegetation from construction of access roads or laydown areas. Care would be taken to prevent all vegetation or soil in any removal actions from entering the watercourse. Leaving debris of any kind in a drainage, stream channel, or watercourse, even if it only runs seasonally, may invoke a penalty under Sections 401 and/or 404 of the *Clean Water Act* if not appropriately permitted. Enough vegetation should remain along channel edges to stabilize the banks. Other BMPs may include establishing streamside management zones that are 15-m (50-ft) buffers on all sides of a perennial streambed, spring, seep, wetland, or any riparian-like area where no disturbance would occur. This would enhance stability of the watercourse.

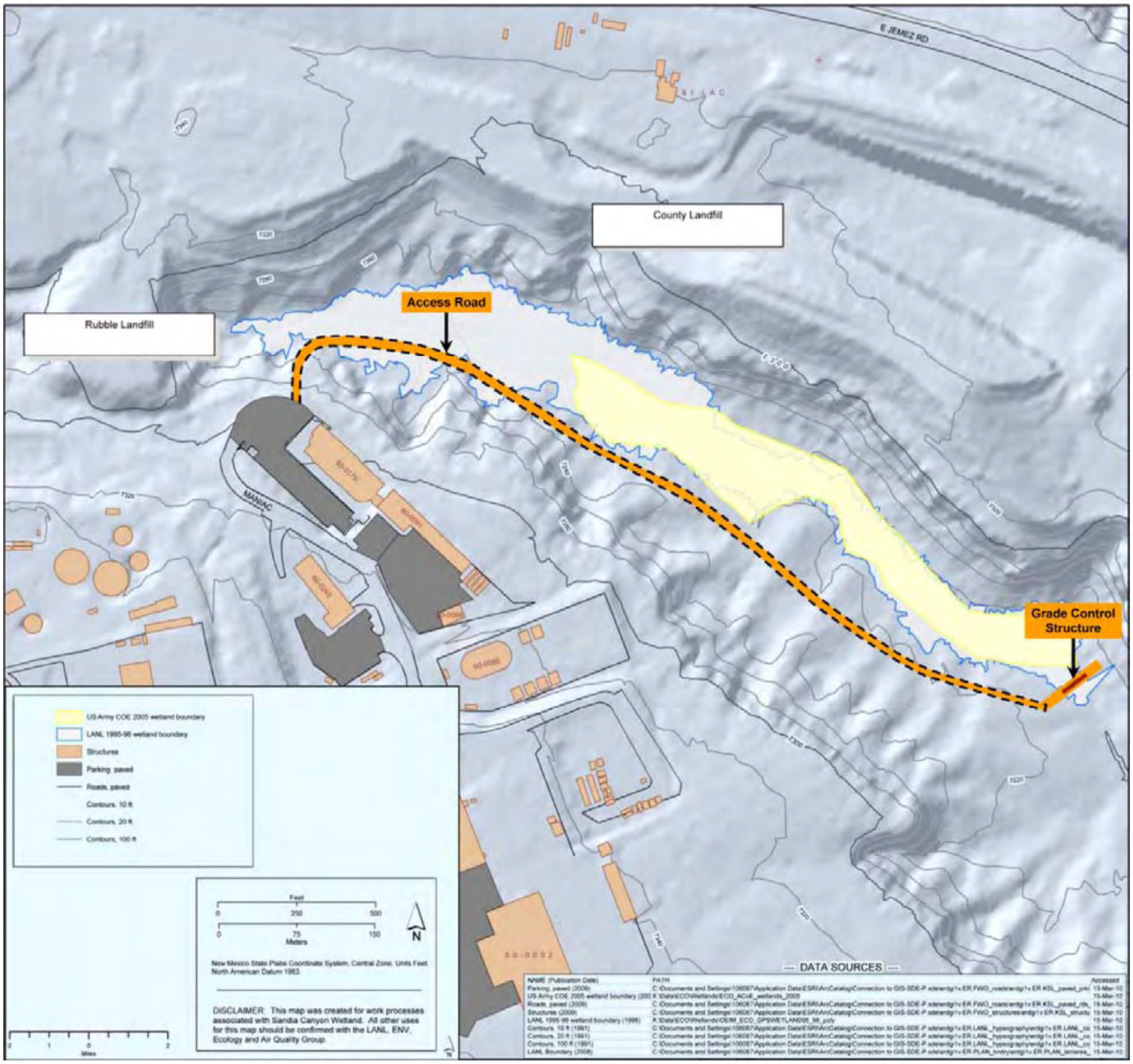

Figure 2-5 Proposed Locations for the Reach S-2 Access Road and Grade Control Structure

2.8.1 Alternative 1—Stabilization in Place with Long-Term Monitoring

This alternative would involve the installation of a grade control structure at the eastern (downstream) end of reach S-2 (see Figure 2-5). The structure would stabilize the stream channel and eastern end of the wetland while preventing stream flow, especially during storm runoff events, from headcutting or incising a deeper channel, mobilizing contaminated sediments, and lowering the water table.

Wastewater discharged to upper Sandia Canyon from the NPDES-permitted outfalls flows for about 2,100 ft (640 m) through a well-defined channel. Although the channel continues in a less well-defined fashion, the surface water and ground water become somewhat indistinguishable, creating a water-saturated area that supports about three acres (1.2 hectares) of predominately wetland vegetation. This resource area is discussed in more detail in Chapter 3. At the lower end of the wetland area, the canyon narrows sharply. Head cutting erosion of the sediment occurs in this area. Perennial surface water flow extends approximately 2.5 miles (4 kilometers) further downstream before infiltrating into shallow alluvium in the canyon floor.

The proposed grade control structure would use basic design components of the DP Canyon grade control structure recently installed at LANL (Figure 2-6). Rock-filled, wire mesh gabions would be placed across the width of the stream channel extending about 30 to 50 feet (10 to 15 m) in length and anchored 4 to 6 feet (1.2 to 1.8m) into bedrock. The gabions would be stacked approximately 6 feet (1.8 m) high and would be located just downstream from the area of on-going sediment erosion. The height of the structure would be designed to establish a grade consistent with the current surface of the wetland sediments in reach S-2. This action could be supplemented with plantings of suitable wetland vegetation such as native willows (*Salix* spp.). About 10 to 12 workers laboring over two months during daylight hours would be required to install the grade control structure.

The installation of the gabions, fill material, and possible wetland vegetative plantings would constitute the first phase for this alternative. Long-term monitoring through adaptive resource management[3] would also be employed to determine the satisfactory functioning of these actions and whether additional stabilization activities were necessary.

If determined necessary by the adaptive resource management and monitoring program, additional measures would be implemented to maintain stable conditions. Additional measures could include the installation of perforated metal plates within the alluvium to disperse subsurface flow and to maintain saturated or moist soil conditions over the area. These are metal diversion walls (sheet piles) driven into the alluvium to prevent the development of preferential groundwater pathways. Such walls are incorporated into the design of the DP Canyon grade control structure (LANL 2008a). The metal diversion wall may be required to enhance surface and subsurface water saturation across the area of wetland vegetation.

The overall effect of the Stabilization in Place Alternative would be to create a more stable area of moist soils that would minimize erosion of contaminated sediment in reach S-2. A monitoring program would be established to measure the effectiveness of the grade control structure and to determine if additional control measures are necessary. Additional discussion of the existing site conditions and reach S-2 contamination is provided in Chapter 3 of this EA.

The proposed location of the grade control structure for reach S-2 is shown in Figure 2-5 and the conceptual design of the structure is shown in Figure 2-6. If the quantity of effluent released into the canyon and the occurrence of stormwater runoff and snowmelt is insufficient to maintain contaminant stability in reach S-2, as determined through the adaptive resource management

[3] Adaptive resource management practices are structured, iterative processes aimed at evaluating results and adjusting actions based on what has been learned, providing feedback between system monitoring and decisions, characterization of system uncertainty though multi-model interface, and embracing risk and uncertainty as a way of building understanding. These practices are particularly applicable for systems in which learning via experimentation is impractical.

Figure 2-6 DP Canyon Grade Control Structure Looking Downstream

practices, the SERF effluent discharge amounts could be increased as appropriate as part of this alternative to meet the determined soil saturation requirements.

2.8.2 Alternative 2—Removal with Off-Site Disposal

A second alternative for the environmental restoration of reach S-2 would be to excavate all sediment and soils with contamination above specified action levels, using heavy machinery such as dozers, back hoes, front-end loaders, and dump trucks. An upper bounding limit of approximately 100,000 yd^3 (76,579 m^3) of contaminated sediments and soils would be removed. The sediment and soils excavated from reach S-2 would be containerized, characterized for waste management purposes, and then transported by truck to an appropriate licensed off-site disposal facility.

For the purposes of this analysis, the anticipated disposal facility would be Energy Solutions of Utah or a similar licensed treatment, storage, and disposal facility (TSDF). Soils that are characterized as New Mexico Special Waste could be shipped to a TSDF in Rio Rancho, NM. It is estimated that between 5,000 to 10,000 shipments by truck may be required, with 10 to 20 yd^3 (8 to 15 m^3) of sediments and soil transported in each truckload. An equal number of truckloads would be required to import clean fill to the excavated area. Restoration actions would restore reach S-2, to the extent practicable, to pre-1942 natural conditions using clean fill material and a plant cover of native shrubs and grasses. It is estimated that up to 16 months may be required to accomplish removal, disposal, and restoration activities, with additional time required for any delays due to weather and other factors. Work would be performed during daylight hours.

2.9 Alternatives Considered but Dismissed

2.9.1 Expand the SERF Treatment Capacity from 100,000 gal./d (378,541 l/d) to Approximately 300,000 gal./d (1.136 million l/d) to Treat SWWS Plant Effluent and TA-3 Power Plant Blowdown; Discharge all Effluent to Sandia Canyon via Outfall 001

An alternative considered for analysis was the operation of the expanded SERF to treat SWWS Plant effluent and boiler water blowdown from the TA-3 Power Plant for discharge via Outfall 001 without recycling. Although the treated effluent would meet more stringent discharge requirements for PCBs in the NPDES permit, cooling tower blowdown from SCC and LDCC would continue to be discharged via existing Outfalls 03A027 and 03A199. This alternative would comply with NPDES permit limits, but would not meet the water reduction goals and objectives established in Executive Order 13514 and DOE directives. For these reasons, this alternative was determined to not meet the stated purpose and need for action and has been dismissed from further consideration in this EA.

2.9.2 Construct an Engineered Cover in Reach S-2

Another alternative considered was the design and installation of an engineered soil cover over the area of contaminated sediments in reach S-2 to retain the sediments and isolate them from erosion. Due to the extent of reach S-2 (approximately 2,500 ft [760 m] long and up to 200 ft [61 m] wide) and its irregular dimensions and topography, designing and installing an engineered cover would pose significant technical challenges.

The cover would be located in the floodplain of Sandia Canyon, vulnerable to erosion from storm event flooding, and would require periodic maintenance or reconstruction. Erosion of the stream channel would potentially continue at the lower end of the reach, progressively compromising the integrity of the cover, which could lead to contaminant migration. Planting wetland-adapted vegetation would not be possible in the area where the engineered cover would be installed, as root systems would affect the integrity of the cover. The environmental effects of this alternative are bounded by the other alternatives. Due to the technical considerations and possible failure of this action to address the stated purpose and need for action, this alternative has been dismissed from further consideration in this EA.

2.9.3 Construct a Stormwater Retention Structure in Reach S-2

A third alternative considered to meet the stated purpose and need for actions was the installation of a stormwater retention structure to moderate storm events and slow down the release of storm-generated water flows. A large stormwater retention structure was installed in 2000 within the Two-Mile Canyon watershed immediately after the Cerro Grande Fire.

Although not necessarily on that same scale, a stormwater retention structure placed in the middle of reach S-2 could effectively reduce silt erosion in that area of the canyon. However, the cost and maintenance of such a structure would be great and erosion issues would continue at the eastern end of reach S-2 where on-going erosion is currently a concern. Additionally, the acreage in reach S-2 that currently supports predominately wetland vegetation would be lost during the placement of the retention structure, although a new area might form later along the upstream side of the retention structure. Given the probable success of other less costly actions that would result in fewer natural resource impacts, this alternative was dismissed from further consideration in this EA.

CHAPTER 3

3.0 AFFECTED ENVIRONMENT

3.1 REGIONAL SETTING

LANL and the associated communities of Los Alamos and White Rock are located in Los Alamos County in north-central New Mexico (Figure 1-1). LANL is located on the Pajarito Plateau, which lies on the eastern flank of the Jemez Mountains, and consists of a series of finger-like mesas with deep, southeast-trending canyons (DOE 2008).

This chapter describes the natural and human environment that could be affected by the action alternatives and the No Action Alternatives analyzed in this EA. The potential environmental consequences of those actions are presented in Chapter 4, together with possible mitigations. Environmental resources that may potentially be affected as a result of implementing the action alternatives have been considered. Table 3-1 identifies the subsections in Chapter 3 where potential environmental issues are discussed, and notes issues not affected by the action alternatives. Several aspects of the environmental resources may be discussed in the context of more than a single resource area (for example, wetlands are both a surface water feature and an ecological habitat resource).

Table 3-1. Potential Environmental Issues Applicable to this EA

Environmental Category	Applicability	Subsection
Geology and Soils	Yes	3.2
Water Resources	Yes	3.3
Ecological Resources	Yes	3.4
Cultural Resources	Yes	3.5
Air Quality	Yes	3.6
Noise	Yes	3.7
Human Health	Yes	3.8
Utilities and Infrastructure	Yes	3.9
Traffic and Transportation	Yes	3.10
Environmental Restoration and Waste Management	Yes	3.11
Land Resources	No. None of the Proposed Action options would change the land use in TA-3 or in reach S-2 of Sandia Canyon.	N/A
Prime and Unique Farmland	No. No Prime and Unique Farmland (as designated under the *Farm Protection Policy Act*) is located in Los Alamos County.	N/A
Socioeconomic Resources	No. Construction of the Expanded SERF and environmental restoration of reach S-2 would result in minimal, temporary, local employment increases.	N/A
Environmental Justice	No. The Proposed Action options are not anticipated to disproportionately impact low income or minority populations.	N/A
Visual Resources	No. The Proposed Action options are not anticipated to appreciably change the visual appearance of TA-3. If selected, one ER option would result in a short-term change in the visual appearance of reach S-2 as seen from certain viewpoints within LANL and Royal Crest Mobile Home Park.	N/A

3.2 GEOLOGY AND SOILS

The geology of the LANL region is the result of complex faulting, sedimentation, volcanism, and erosion over the past 20 to 25 million years (DOE 1999a). LANL lies on the Pajarito Plateau, which is formed of volcanic tuffs (welded volcanic ash) deposited by past volcanic eruptions from the Jemez Mountains to the west.

The upper sequence of rocks that underlie LANL are exposed in the 600- to 1,000-ft (183- to 305-m)-deep, steep-sided canyons cut into the surface of the Pajarito Plateau. The exposed rocks range in age from middle Eocene sediments of the Santa Fe Group to Quaternary alluvium (Lavine et al. 2003). The layers vary in hardness and resistance to erosion; the light-colored units tend to be softer and to form slopes on canyon walls, while darker-colored units tend to be harder and to form vertical cliffs.

The geologic structure of the LANL area is dominated by the north-trending Pajarito Fault system. The Pajarito Fault system forms the western structural boundary of the Rio Grande Rift along the western edge of the Española Basin and the eastern edge of the Jemez Mountain Volcanic Field (Figure 3-1). The Pajarito Fault system consists of three fault zones—Pajarito, Guaje Mountain, and Rendija Canyon—and numerous secondary faults with vertical displacements ranging from 80 to 400 ft (24 to 120 m).

Estimates of the timing of the most recent surface-rupturing earthquakes along this fault range from 3,000 to 24,000 years ago (LANL 2001b, 1999a). Results of seismic hazards studies (LANL 2001b, 1999a; Wong et al. 1995) indicate the Pajarito Fault system represents the greatest potential seismic risk to LANL, with an estimated maximum earthquake magnitude of about 7 on the Richter scale. Although large uncertainties exist, an earthquake with a Richter magnitude of 6 is estimated to occur once every 4,000 years; an earthquake of magnitude 7 is estimated to occur once every 10,000 years (LANL 2007b).

Most LANL facilities, including the SERF, are located on mesa tops where the soils are generally well-drained and thin at 0 to 40 in. (0 to 102 cm) deep. A general description of LANL soils was included in the 1999 and 2008 Site-Wide Environmental Impact Statements (SWEIS) (DOE 1999a, 2008). An extensive soil survey of Los Alamos County was performed in 1978 (Nyhan et al. 1978) and provides detailed soil maps of the LANL area, including TA-3.

3.2.1 SERF

The bedrock exposed at the surface at TA-3 includes cooling units 3 and 4 of the Quaternary Bandelier Tuff (Qbt 3 and Qbt 4, respectively). At the SERF, the surface rock is the upper portion of Qbt 3 near the contact with Qbt 4 (LANL 1999a), a nonwelded to partly-welded, devitrified ash flow deposit. The upper part of Qbt 3 is a partly-welded tuff that forms the caprock of mesas in the central part of the Pajarito Plateau (Figure 3-2). Characteristics of the Bandelier Tuff that may affect the surface and subsurface movement of water include (1) porosity between about 45 and 50 percent, which under unsaturated conditions may create a capillary suction that holds liquid water; (2) discontinuous open fractures in the more welded units, which under unsaturated conditions may enhance the evaporation of moisture from the subsurface; and (3) variable welding that may influence permeability (LANL 1997).

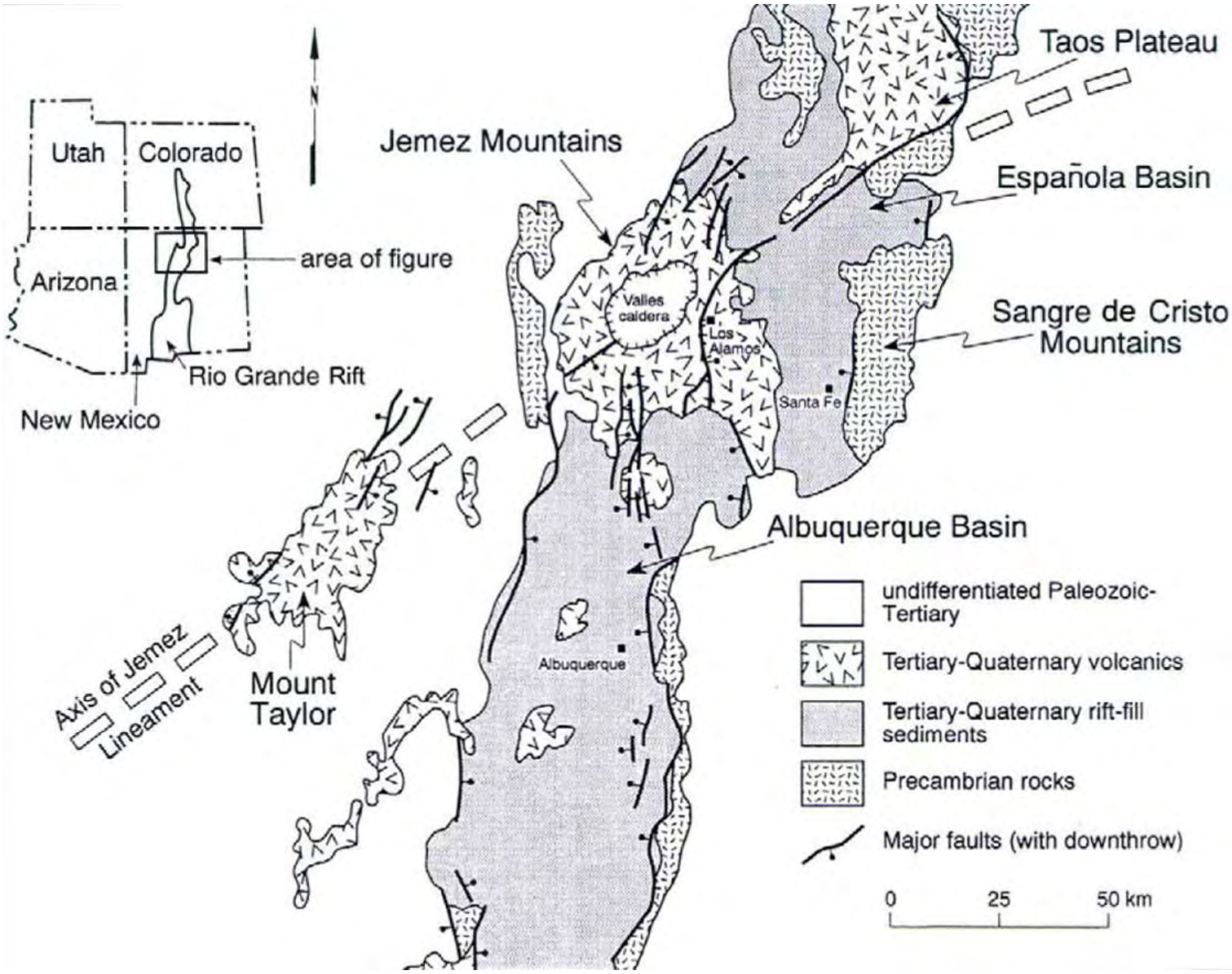

Figure 3-1 Generalized Geologic Map of the Rio Grande Rift in Northern New Mexico (Self and Sykes 1996)

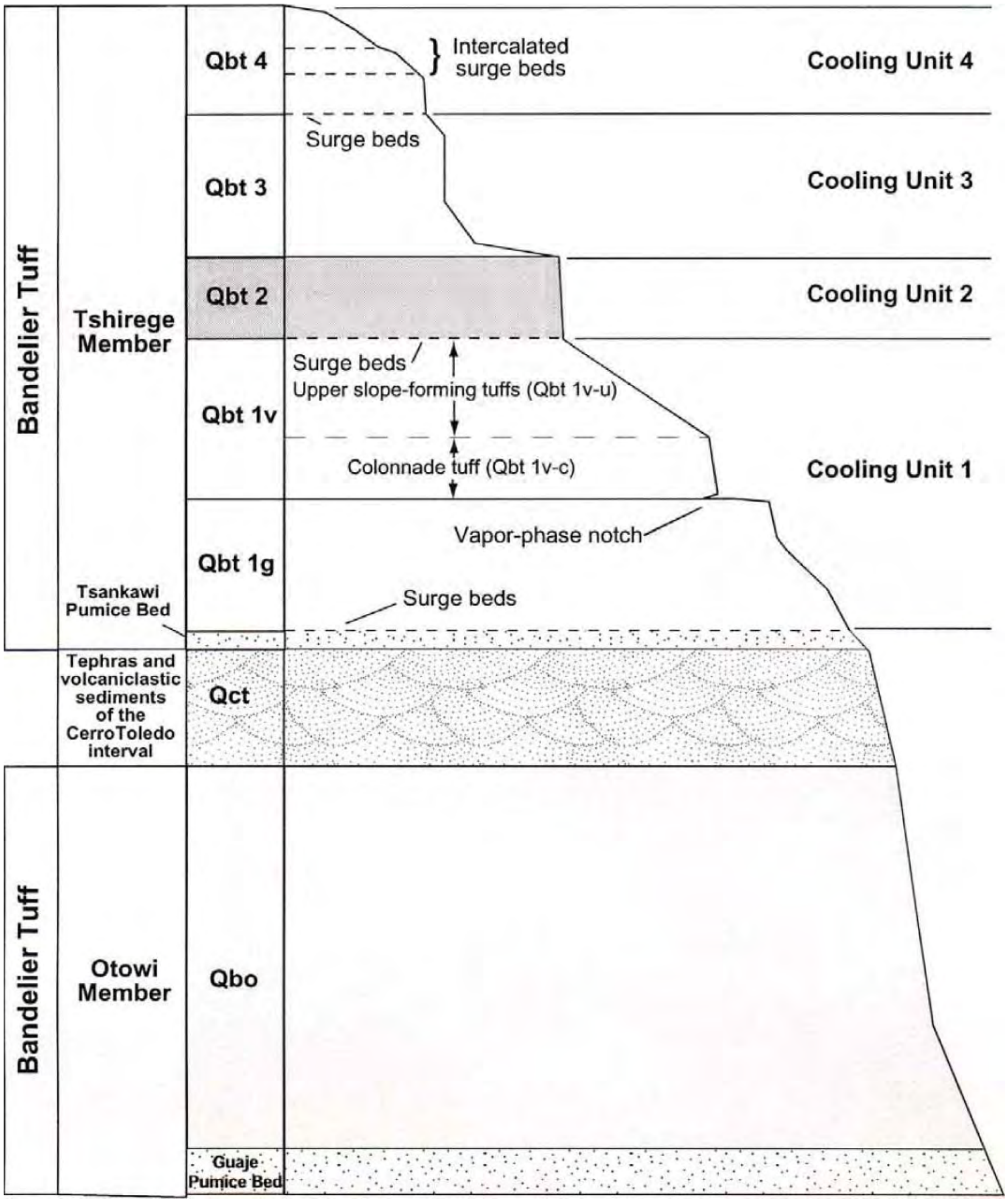

Figure 3-2 Stratigraphy of the Bandelier Tuff (LANL 1995a)

Numerous geologic faults exist in the LANL area. An inferred fault trace has been identified within a few hundred feet to the north of the SERF location. The fault trends generally west to east, terminates at or near the head of Sandia Canyon, and has a vertical offset of only 10 to 15 ft (3 to 5 m) down to the north (LANL 1999a). Additional faults have been identified or inferred to exist in the TA-3 area, generally trending northeast to southwest or west to east. Most of the faults have only minor vertical offsets of a few feet.

Soils at the SERF are identified as a rock outcrop type—Rock Outcrop, Steep (RS) (Nyhan et al. 1978). The RS land types are partly based on slope where slope is greater than 30 percent on steep to very steep mesa breaks and canyon walls. RS consists of about 90 percent rock outcrop (Bandelier Tuff) and 10 percent very shallow undeveloped soils. Based on engineering properties, the rock outcrop land types are well suited for construction as they consist predominantly of local bedrock. Localized inclusions of other soil types, however, may have significantly different properties (Nyhan et al. 1978).

3.2.2 Reach S-2

Reach S-2 of Sandia Canyon consists predominantly of post-1942 sediments (including fine and coarse deposits) in the canyon floor with interbedded alluvial fan deposits and colluvium along the margins. These deposits overlie the Tshirege Member of the Bandelier Tuff. The canyon-floor deposits vary in width, perpendicular to the channel, from approximately 82 to 197 ft (25 to 60 m). Cross-sections through the canyon-floor deposits at various locations in reach S-2 are provided in the 2009 Sandia Canyon Investigation Report (LANL 2009c).

The Rendija Canyon fault zone crosses the upper portion of Sandia Canyon near the east end of reach S-2 (LANL 2009c). Studies of the Rendija Canyon Fault in other locations indicate that it is a dominantly down-to-the-west normal fault with displacement up to 130 ft (40 m) (LANL 2007b). Displacement along the fault zone gradually decreases to the south as the zone of deformation broadens (LANL 2004a). Very little to no displacement is observed in Sandia Canyon. Trench exposures across the Rendija Canyon Fault at Guaje Pines cemetery indicate that the most recent surface rupture occurred about 8,600 to 23,000 years ago (LANL 2007b).

The 2009 Sandia Canyon Investigation Report (LANL 2009c) includes a plate (Plate 3) which show the spatial distribution of geomorphic units—both channel and floodplain sediments—with varying physical characteristics, contaminant concentrations, and/or age. Information about sediment contaminants present in reach S-2 is provided later in this chapter in sub-sections 3.3.1 (surface water) and 3.11.1 (environmental restoration); a discussion of blowing soil as dust is provided later in sub-section 3.6 (air quality). Soils and sediments serve important roles in the stabilization of various contaminants as certain contaminants will preferentially chemically adhere to soil and sediment particles rather than dissolving in water.

3.3 WATER RESOURCES

Water resources in the LANL region are used for human consumption, traditional and ceremonial uses by pueblos, aquatic and wildlife habitat, domestic livestock watering, irrigation, industry, and commercial purposes. Water resources in proximity to LANL may be affected by water withdrawals, effluent discharges, waste disposal, spills and unplanned releases, soil erosion, or stormwater runoff from LANL operations.

LANL water resources are regulated under a variety of laws and regulations (including the *Clean Water Act* (CWA), *Safe Drinking Water Act*, the New Mexico Water Quality Control Commission (NMWQCC) regulations, and DOE Orders). In accordance with the Consent Order, the Environmental Protection Program, and other statutory requirements, LANL personnel routinely monitor surface water, stormwater, and sediments as part of their ongoing environmental monitoring and surveillance program. The monitoring results are published annually in Environmental Surveillance Reports and are available from the Risk Analysis Communication, Evaluation, and Reduction (RACER) database. LANL personnel implement a site-wide monitoring program that integrates groundwater, surface water, stormwater, and sediment monitoring on a watershed basis.

3.3.1 Surface Water

Surface water resources generally consist of wetlands, lakes, rivers, and streams. Surface water is important for its contributions to the economic, ecological, recreational, and human health of a community or locale. The CWA (33 U.S.C. 1251 et seq., as amended) establishes federal limits through the NPDES program on the amounts of specific pollutants discharged to surface waters in order to restore and maintain the chemical, physical, and biological integrity of the water. The NPDES program regulates the discharge of point (end of pipe) and nonpoint (stormwater) sources of water pollution. Section 404 of the CWA regulates the discharge of fill material into waters of the U.S., which includes wetlands. As wetlands are often also important ecological resources providing habitat for wildlife, a discussion of wetlands is also included later in sub-section 3.4.2 of this chapter of the EA.

Waters of the U.S. are defined within the CWA as amended, and the EPA and the USACE address jurisdiction. These agencies assert jurisdiction over (1) traditional navigable waters, (2) wetlands adjacent to navigable waters, (3) nonnavigable tributaries of traditional navigable waters that are relatively permanent where the tributaries typically flow year-round or have continuous flow at least seasonally (typically about 3 months), and (4) wetlands that directly abut such tributaries.

In 2010, the EPA issued a Final Rule for the CWA concerning technology-based Effluent Limitations Guidelines and New Source Performance Standards for the Construction and Development point source category. All NPDES stormwater permits issued by the EPA or states must incorporate requirements established in the Final Rule. The rule requires all construction site owners and operators to implement a range of erosion and sediment control BMPs to reduce pollutants in storm water discharges. Permittees are also required to implement a range of pollution prevention measures to control discharges from activities such as dewatering and concrete washout. The rule also contains requirements for soil stabilization. These limitations and non numeric erosion and sediment controls include the following:

- Control stormwater volume and velocity to minimize erosion.
- Control stormwater discharges, including both peak flow rates and total stormwater volume.
- Minimize the amount of soil exposed during construction activities.
- Minimize the disturbance of steep slopes.

- Minimize sediment discharges from the site using controls that address factors such as amount, frequency, intensity, and duration of precipitation; the nature of resulting stormwater runoff; and soil characteristics, including the expected range of soil particle sizes on the site.
- Provide and maintain natural buffers around surface waters, direct stormwater to vegetated areas to increase sediment removal, and maximize stormwater infiltration where feasible.
- Minimize erosion at outlets and minimize downstream channel and stream bank erosion.
- Minimize soil compaction and preserve topsoil where feasible.

EPA is phasing in the numeric limitations over four years. Beginning on August 1, 2011, construction sites that disturb 20 or more acres at one time will be required to conduct monitoring of discharges and comply with numeric limitations. On February 1, 2014, the monitoring and effluent limitation requirements will apply to sites that disturb 10 or more acres.

Surface water in the LANL area includes 15 watersheds; 12 of these watersheds cross LANL boundaries (DOE 2008). Figure 3-3 shows the locations of the 15 watersheds as well as the remaining LANL industrial outfalls as of 2004. Some of the outfalls have been eliminated over the past six years and others are in the process of being eliminated. Outfalls eliminated include 02A129-Steam Plant, 03A021-CMR, 03A158-TSTA, 031047-LANSCE, 03A049-LANSCE, 03A130-VF, and 05A055-HEWTF. Also, see Section 2.2. Most streams within the LANL boundaries are ephemeral and surface flow is intermittent in character; only a few of the LANL canyons have short stretches of perennial surface stream flows. Most watersheds have one or more zones of direct alluvial groundwater recharge, where the surface water flow disappears beneath the ground surface and infiltrates the alluvial groundwater aquifer.

3.3.1.1 SERF

The SERF is located at TA-3 along the southern rim of Sandia Canyon (Figure 2-1). No surface water is present at this facility. The closest surface water to the SERF is in Sandia Canyon.

3.3.1.2 Reach S-2

Sandia Canyon watershed starts from the Pajarito Plateau in TA-3, has a maximum elevation of approximately 7,600 ft (2,320 m) above sea level (asl), and extends southeastward approximately 10.9 mi (17.6 km) to the Rio Grande at an elevation of approximately 5,445 ft (1,660 m) asl (Figure 3-4). The watershed has a drainage area of 5.5 mi^2 (14.2 km^2).

Reach S-2 is the second reach downcanyon from the headwater area in Sandia Canyon (Figure 3-4). No natural streams exist in reach S-2. However, industrial effluents from LANL activities maintain an area of saturated sediment and a perennial shallow streamflow through reach S-2 and farther downcanyon. Persistent surface flow occurs from NPDES outfalls that flow across the wider portion of reach S-2 into the narrow bedrock area of the upper canyon. The perennial surface flow generally extends an additional 2.5 mile (4 km) beyond reach S-2 (Figure 3-5) where it infiltrates into sediment forming a shallow alluvial aquifer of limited extent (LANL 2009c). Stormwater runoff and snowmelt contribute seasonally to the stream flow in Sandia Canyon.

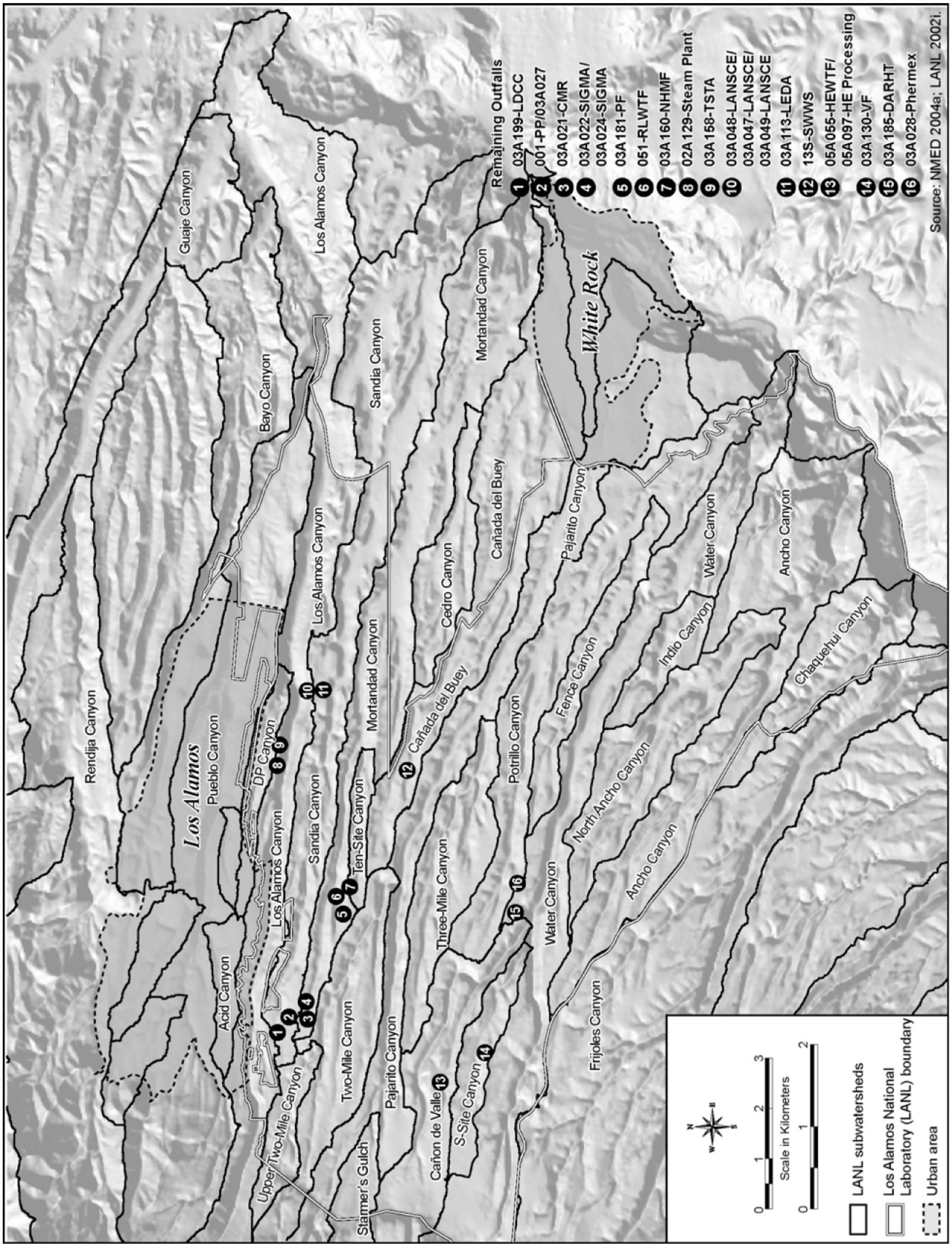

Figure 3-3 Watersheds in the Los Alamos National Laboratory Region (Source: DOE 2008)

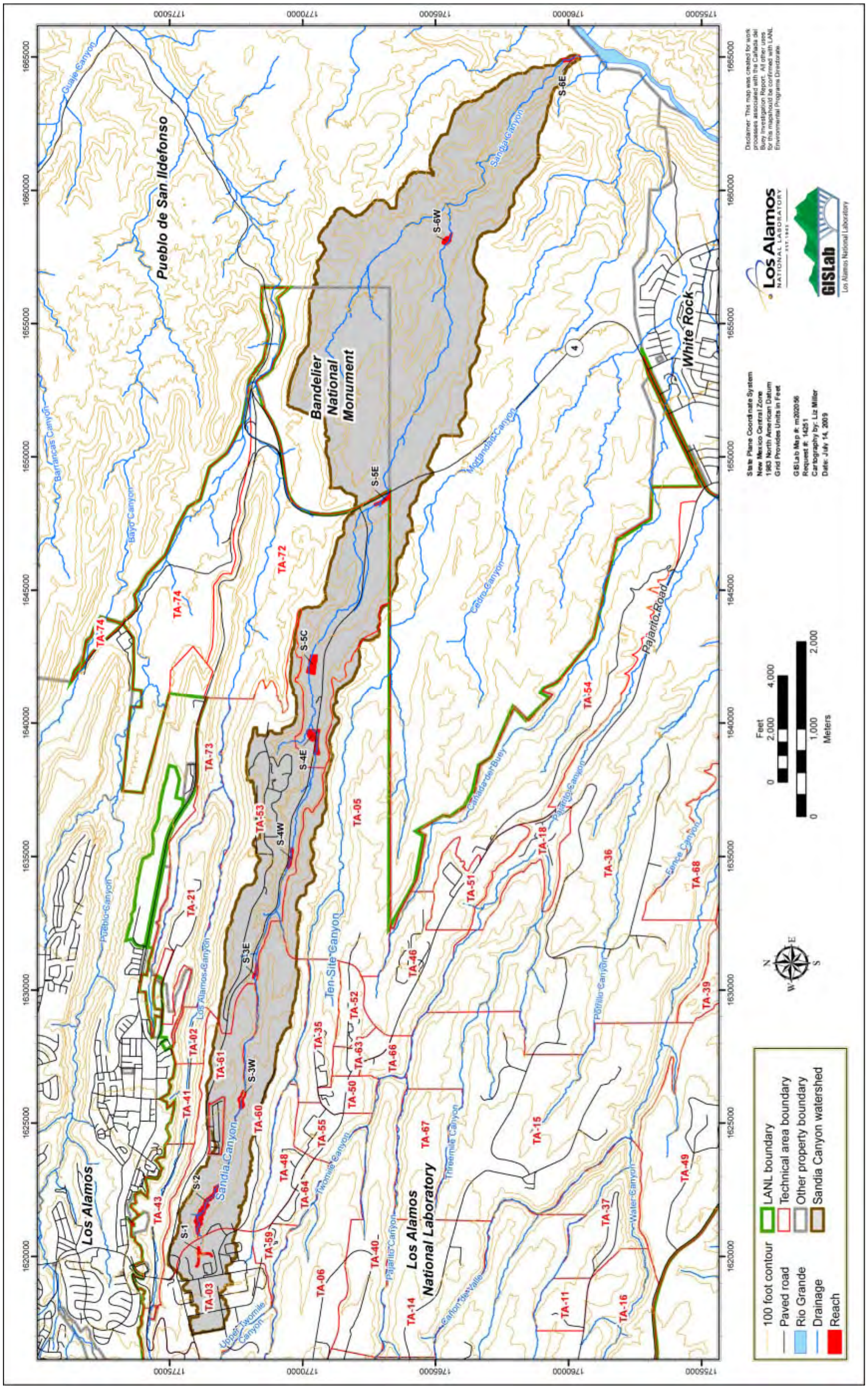

Figure 3-4 Sandia Canyon Watershed and Reach S-2 (Source: LANL 2009c)

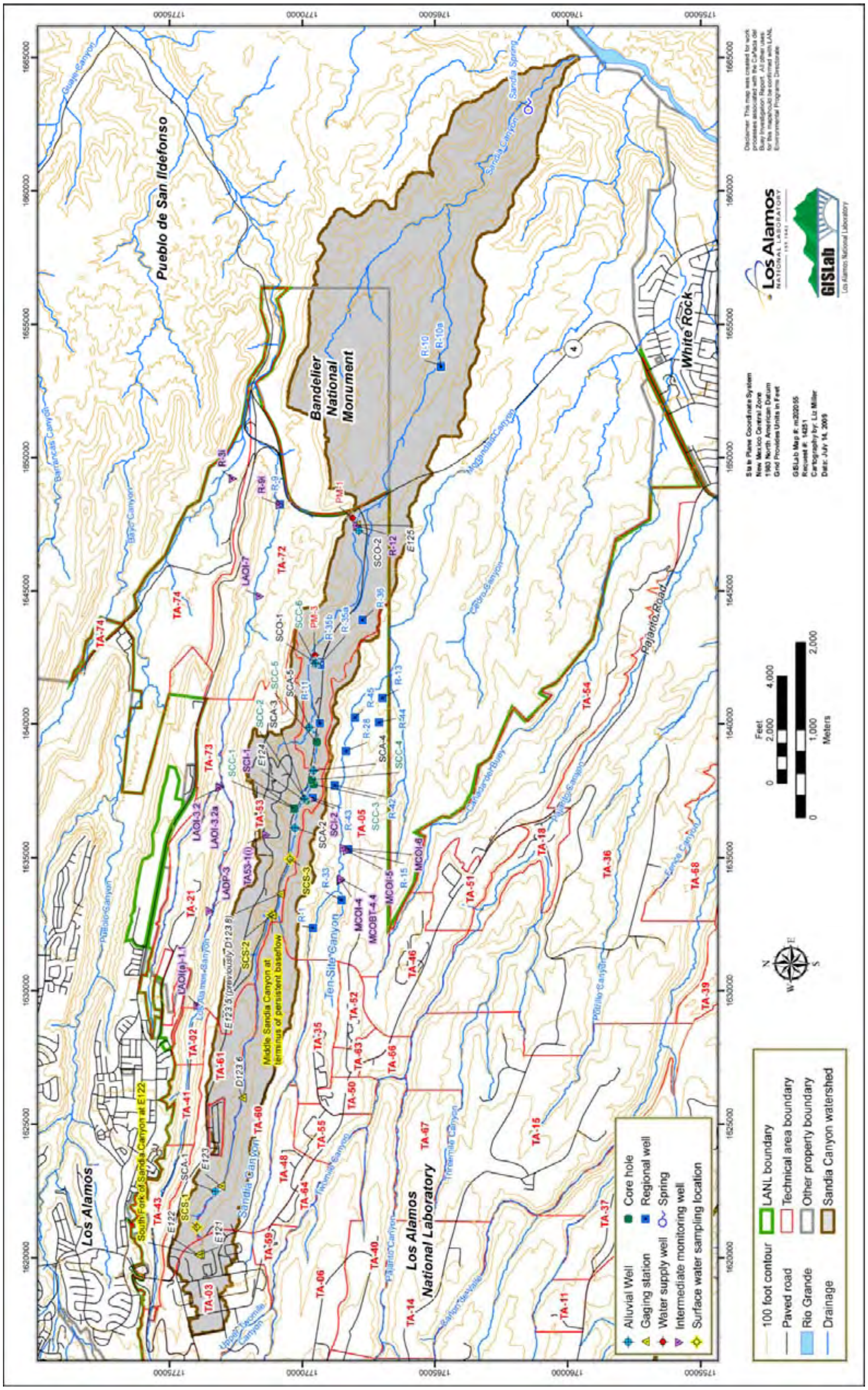

Figure 3-5 Sandia Canyon Watershed and Water Sampling Locations (Source: LANL 2009c)

Sources of surface water in the entire Sandia Canyon watershed are currently dominated by effluent releases. Effluent releases to Sandia Canyon have occurred since the early 1950s and continue today. The primary sources for the releases are LANL's treated sanitary wastewater and cooling tower blowdown. Currently, three NPDES-permitted outfalls discharge to upper Sandia Canyon in the TA-3 area:

- NPDES Outfall 001 discharges effluent, predominantly from the Laboratory's TA-46 SWWS Plant and the TA-3 Steam Plant boilers. Effluent for infrequent cooling of the TA-3 Power Plant gas turbines is also discharged here. Outfall 001 is the main effluent source of water to Sandia Canyon, discharging up to 290,000 gal./d (1,096,000 L./d).
- NPDES Outfall 03A027 and Outfall 03A199 (associated with cooling towers at the SCC and the LDCC, respectively) also discharge to upper Sandia Canyon. These two outfalls contribute a maximum of 120,000 gal./d (454,000 L./d) of cooling water blowdown to the canyon.

Outfall 001, Outfall 03A027, and Outfall 03A199 are shown in Figure 3-3 at locations 1 and 2. The daily outfall volumes are recorded and the effluent at the outfall points is monitored in compliance with the NPDES permit. Data from 2007 and 2008 indicate that industrial outfalls contribute approximately 75 percent of the total surface water flow in the canyon, with stormwater runoff and snowmelt contributing the remainder of the water flow (LANL 2008b).

Chromium and PCBs have been monitored as contaminants in surface water for a number of years in Sandia Canyon. Chromium was discharged from the TA-3 Power Plant from 1956 to 1972, and PCBs were released primarily from a transfer storage facility in TA-3. Additional information about these contaminants in sediments within Sandia Canyon is provided later in this chapter in subsection 3.11.

In 2008, chromium was detected above the water screening action level of 77 μg/L for a designated perennial stream segment in one of eight non-filtered surface water samples from gage E123 below the wetland in reach S-2. The chromium was almost entirely associated with sediment particles. The maximum 2008 chromium sample level was below the 2007 level. NMWQCC standards for aquatic life, based on dissolved chromium, were not exceeded in 2008 (LANL 2009a).

In 2008, PCBs were detected in about 25 percent of the surface water samples collected in Sandia Canyon, with all detected concentrations above the screening level of 0.00064 μg/L. Stormwater concentrations were highest at gage E123, below the wetland in reach S-2. The maximum concentration of PCBs detected at this gage in 2008 was below the maximum concentration detected in 2007 (LANL 2009a).

NMED uses a variety of mechanisms including state, federal, and/or local programs to protect and restore the quality of surface waters. The process of correcting impairments begins with the identification of an impaired water body on the CWA §303(d) *List of Impaired Water bodies*, these waters are categorized and incorporated into the *New Mexico Statewide Water Quality Management Plan* (WQMP). This statewide plan broadly addresses water quality concerns and serves as an important planning tool for the prevention and correction of water quality impairments. The principal mechanism used to protect waters from municipal and industrial point source discharges is the federal NPDES program. The state's Nonpoint Source

Management Program works to prevent and correct water quality impairments from nonpoint sources of surface water pollution. NMED also utilizes a variety of state, local, and federal agency programs to achieve implementation of BMPs to prevent and abate nonpoint source pollution (Saladen 2010).

According to the *2010-2012 State of New Mexico Clean Water Act, Section 303 Integrated List Report*, NMED's Surface Water Quality Bureau (SWQB) performed a comprehensive assessment of surface water quality of the Pajarito Plateau. All readily available surface water quality data collected during 2004-2008 from watershed stations were used for assessment. The assessment of surface water quality included over 29,000 data values from 78 stations and represents the largest single surface water quality assessment conducted by NMED. The water quality assessment included data collected by the SWQB, the DOE Oversight Bureau, and LANL. The SWQB dataset was collected as part of a special study of the Pajarito Plateau in 2006 and 2007 funded by the EPA (Saladen 2010).

The results of the surface water quality assessment confirmed the water quality impairment in Sandia Canyon, Assessment Unit NM-9000.A-047 (Sigma Canyon to NPDES Outfall 001) and Assessment Unit NM-128.A-11 (within LANL below Sigma Canyon) for aluminum, copper, gross alpha-adjusted, mercury and PCBs. NMED categorized these reaches under Category 5/5C. Water bodies classified as Category 5, which constitute the *CWA §303(d) List of Impaired Waters*. The 5C identification means that available data and/or information are available to indicate that at least one designated use or existing use is not being supported but additional data are necessary to verify the listing. As a result, NMED is responsible for developing total maximum daily loads (TMDLs) for pollutants identified in the impaired waters listings. A TMDL planning document is a written plan and analysis established to restore a water body and to ensure that water quality standards are maintained for that water body. Once developed, these TMDLs may incorporate sediment mitigation activities, and other corrective action strategies that effectively respond to the needs identified in the assessment process, and ensure that the attainment status of each water quality standard applicable to the particular segment is addressed. NMED has scheduled the TMDL to be developed in 2012. Additionally, TMDLs include consideration of existing pollutant loads and reasonably foreseeable increases in pollutant loads (Saladen 2010).

LANL has active surface water and ground water programs that currently monitor storm water, base flow, and alluvial water quality in Sandia Canyon. This information may be incorporated into NMED's TMDL Development Program (Saladen 2010).

3.3.2 Groundwater

3.3.2.1 SERF

Groundwater in the LANL region occurs near the surface in the canyon bottom alluvium, perched at deeper (intermediate) levels below the alluvium, and at still deeper levels in the regional aquifer. The regional aquifer occurs at approximately 1,200 ft (365 m) below the mesa top at the head of Sandia Canyon where the SERF is located (LANL 1999b). The upper portion of Sandia Canyon is incised approximately 80 to 150 ft (24 to 46 m) into the Tshirege Member of the Bandelier Tuff (LANL 1999b). The regional aquifer is separated from the alluvial groundwater in the canyon bottom at reach S-2 by approximately 1,100 ft (335 m) of unsaturated volcanic tuff and sediments.

3.3.2.2 Reach S-2

Continually saturated alluvial groundwater occurs in reach S-2. Alluvial groundwater monitoring well SCA-1 is located in upper Sandia Canyon in reach S-2 (Figure 3-5). The well is shallow and fully saturated. The water level is effectively the surface water level because the well is fully saturated to above the ground surface. Also, the water level variations at this location are minor, suggesting that storage volume and conductive capacity of reach S-2 are great enough to minimize seasonal and stormwater level fluctuations. Despite the presence of alluvial groundwater in reach S-2, a recent study on the surface water losses along the length of the canyon bottom indicates that little infiltration of surface water occurs below reach S-2 (LANL 2008b, LANL 2009c).

No perched-intermediate groundwater aquifer has been identified beneath upper Sandia Canyon, including beneath the mesa top where the SERF is located. Two perched-intermediate zones are monitored by SCI-1 and SCI-2 located in the lower, eastern half of Sandia Canyon (Figure 3-5) (LANL 2009c).

In 2008, samples of alluvial, intermediate, and regional groundwater in Sandia Canyon identified chemical concentrations at or below New Mexico groundwater standards in most instances. Chromium contaminant concentrations in samples from regional aquifer well R-11 were more than 50 percent below New Mexico groundwater standards. However, samples from the new intermediate well SCI-2 identified chromium concentrations at just greater than 10 times the New Mexico groundwater standard of 50 ppb. Further discussion on the water quality data and the overall monitoring results for Sandia Canyon and surrounding areas are provided in the Sandia Canyon Investigation Report (LANL 2009c) and in *Environmental Surveillance at Los Alamos during 2008* (LANL 2009a).

3.4 ECOLOGICAL RESOURCES

Ecological resources include native or naturalized plants and animals and the habitats (such as grasslands, forests, and wetlands) in which they exist. Protected and sensitive biological resources include listed (threatened or endangered), proposed, and candidate species under the *Endangered Species Act* (ESA) (16 U.S.C. 1536) as designated by the U.S. Fish and Wildlife Service (USFWS); state-listed threatened or endangered species; and migratory birds.

Sensitive habitats include those areas designated by the USFWS as critical habitat protected by the ESA and sensitive ecological areas as designated by state or federal rulings. Sensitive habitats also include wetlands, plant communities that are unusual or of limited distribution, and important seasonal use areas for wildlife (such as migration routes, breeding areas, and crucial summer and winter habitats). Ecological resources relevant to LANL's location in New Mexico also include natural and man-made floodplains and wetlands, which are available for use by and for the benefit of wildlife, humans, and the environment.

The *Migratory Bird Treaty Act* of 1918 (16 U.S.C. 703–712) as amended and Executive Order (EO) 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds,* require federal agencies to minimize or avoid impacts on migratory birds listed in 50 CFR 10.13. If design and implementation of a federal action cannot avoid measurable negative impact on migratory birds, EO 13186 directs the responsible agency to develop and implement, within two years, a Memorandum of Understanding with the USFWS to promote the conservation of migratory bird populations.

3.4.1 Floodplains

Floodplains are areas of low-level ground along rivers, stream channels, or coastal waters. The living and nonliving parts of natural floodplains interact with each other to create dynamic ecological systems where each component helps to maintain the characteristics of the environment that supports it. Floodplain ecosystem functions include natural moderation of floods, flood storage and conveyance, groundwater recharge, nutrient cycling, water quality maintenance, and diversification of plants and animals. Flood potential is evaluated by the Federal Emergency Management Agency (FEMA). FEMA defines the 100-year floodplain as an area within which a one percent chance exists of inundation by a flood event in a given year (FEMA 1986).

Floodplains do not occur in the mesa top areas in TA-3 and TA-60 due to the elevation difference from the bottom of Sandia Canyon. However, the entire length of the Sandia Canyon bottom is considered within the 100-year floodplain, with the greatest potential flooding location at the Sandia Canyon origin near Outfall 001 and just upstream of reach S-2. A larger potential flooding area exists downstream, approximately 2 miles east.

EO 11988, *Floodplain Management* (May 24, 1977), directs federal agencies to consider alternatives to avoid adverse effects and incompatible development in floodplains. An agency may locate a facility in a floodplain if the head of the agency finds no practicable alternative. If no practicable alternative is found, the agency must minimize potential harm to the floodplain and, before taking action, circulate a notice explaining why the action is located in the flood-plain. Finally, new construction in a floodplain must apply accepted flood proofing and flood protection that includes elevating structures above the base flood level rather than filling in land.

3.4.2 Wetlands

Wetlands perform several hydrologic functions, including water quality improvement, groundwater recharge and discharge, pollution mitigation, nutrient cycling, stormwater attenuation and storage, sediment detention, and erosion protection. The above ground portions of wetland vegetation serve to slow down stormwater runoff so that sediment particles have a chance to drop out of suspension and settle forming new layers of sediment. The roots of wetland vegetation serve to retard erosion physically by clinging to sediment. Plant roots also provide microhabitats for bacterial colonies that can metabolize certain contaminants, such as chromium, so that the plants can take up the material into its stems, leaves, and other plant parts as nutrients. Wetlands are protected as a subset of the waters of the U.S. under Section 404 of the CWA. The U.S. Army Corps of Engineers (USACE) defines wetlands as "... those areas that are inundated or saturated with ground or surface water at a frequency and duration to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted to life in saturated conditions. Wetlands generally include swamps, marshes, bogs, and similar areas ..." (33 CFR Part 329). At LANL, most wetlands are riparian-type or bog-like in nature, and may be found along ditch banks, at outfall effluent discharge sites, linearly along stream beds, or at groundwater seepage areas where groundwater occurs at ground surface rather than below it.

In 1996, a wetland survey and inventory was prepared by LANL staff. About 50 acres (20 hectares) of wetlands, including some waters of the U.S., were identified within LANL using aerial photography, various maps, and other information. About 13 of those 50 wetland acres were either created or enhanced by effluent discharged from 38 LANL NPDES-permitted outfalls that were functional in 1996. In a 2005 wetland delineation conducted by USACE staff, 30 wetlands occupying portions of 14 different TAs met the USACE criteria. These delineated wetland areas totaled about 34 acres (13.8 hectares).

Many of the outfall-linked wetlands on LANL property identified during the 1996 wetlands survey were not delineated in the 2005 survey due primarily to the closure or re-routing of the outfall sources of water. The reduction in effluent discharge at these sites over the intervening years, and the application of surface hydrology and hydric soil criteria applied during the 2005 survey but not the 1996 survey, explain in part the reduction from 50 acres (20 hectares) to 34 acres (13.8 hectares) of wetlands found in 2005. A further explanation for the difference in wetland acreage found in 1996 versus 2005 is that the methodology used in 1996 included as wetlands waters of the U.S. to the ordinary high water mark. While potential waters of the U.S., these channel areas to the ordinary high water mark were not delineated in 2005 as wetlands that meet the criteria of the 1987 Corps Wetlands Delineation Manual.

In 2005, Sandia Canyon contained approximately 3 acres (1.2 hectares) of wetlands (USACE 2005) and the saturation of this area is due primarily to LANL effluent discharge through NPDES-permitted Outfall 001. Recent site information indicates the wetlands previously delineated as about 8 acres (3.2 hectares) are still in place but have been reduced in size due in part to hydrologic changes in the shallow, perched water table caused by erosional head cutting of the channel upslope into the wetland area. A field delineation of wetlands and streams (potential waters of the U.S.), to accurately determine the hydrologic conditions and existing wetland boundary to assess potential 404 permitting requirements, was conducted in June 2010 (HDR 2010). The 2010 delineation determined that the wetland in reach S-2 of Sandia Canyon was still approximately 3 acres (1.2 hectares).

EO 11990, *Protection of Wetlands* (May 24, 1977), directs agencies to consider alternatives to avoid adverse effects and incompatible development in wetlands. Federal agencies are to avoid new construction in wetlands, unless the agency finds no practicable alternative to construction in the wetland and the proposed construction incorporates all possible measures to limit harm to the wetland. Agencies should use economic and environmental data, agency mission statements, and any other pertinent information when deciding whether or not to build in wetlands. EO 11990 directs each agency to provide for early public review of plans for construction in wetlands.

In accordance with DOE regulations for compliance with floodplain and wetlands environmental review requirements (10 CFR Part 1022), NNSA prepared a floodplain assessment for these actions. The floodplain assessment is provided as Appendix A of this EA.

On March 31, 2008, the EPA and USACE issued revised regulations governing compensatory mitigation for authorized impacts to wetlands, streams, and other waters of the U.S. under

Section 404 of the CWA. These regulations are designed to improve the effectiveness of compensatory mitigation to replace lost aquatic resource functions and area, expand public participation in compensatory mitigation decisionmaking, and increase the efficiency and predictability of the mitigation project review process. The three mechanisms for providing compensatory mitigation are (1) permittee-responsible compensatory mitigation, (2) mitigation banks, and (3) in-lieu fee mitigation.

Permittee-responsible mitigation represents the majority of compensatory acreage provided per year and can be located at or adjacent to the impact site or at another location generally within the same watershed. Mitigation banks and in-lieu fee mitigation, which may also be used to compensate for wetland loss, involve off-site compensation activities generally conducted by a third party (EPA 2008).

3.4.3 Vegetation

Five vegetation zones have been identified within LANL and include (1) juniper (*Juniperus monosperma*) savannas, (2) piñon (*Pinus edulis*)-juniper woodlands, (3) grasslands, (4) ponderosa pine (*Pinus ponderosa*) forests, and (5) mixed-conifer forests (Douglas fir [*Pseudotsuga menziesii*], ponderosa pine, and white fir [*Abies concolor*]). Dominant wetland plant species were identified on LANL land during a USACE wetland delineation survey conducted in May 2005. These included reed canary grass (*Phalaris arundinacea* L.), narrow-leaf cattail (*Typha angustifolia* L.), coyote willow (*Salix exigua* Nutt.), Baltic rush (*Juncus balticus* Wildl.), wooly sedge (*Carex lanuginose* Michx.), American speedwell (*Veronica americana* Schwein. Ex Benth.), common spikerush (*Eleocharis macrostachya* Britt.), and curly dock (*Rumex crispus* L.) (USACE 2005). In a June 2010 wetland delineation survey, the dominant wetland species were cattails and curly dock, with minor amounts of secondary species such as reed canary grass, brome (*Bromus tectorum*), Baltic rush, burhead (*Echinodorus* sp.), coyote willow, and planted cottonwood trees (*Populus deltoides*) (HDR 2010).

The Cerro Grande fire, which began May 4, 2000, burned over 8,000 acres (3,238 hectares) of DOE-administered lands and had direct impacts on terrestrial resources, including a reduction in habitat and loss of wildlife. Also, water bodies and wetlands received increased amounts of ash and hydromulch runoff as a result of the fire (DOE 2000). In the 10 years since the fire, burned areas have started to recover from the effects of the fire. Vegetation has regrown and much of the region’s wildlife species are beginning to return to the burned sites.

3.4.4 Wildlife

Numerous species of wildlife are found on LANL property and many live in or pass through the canyons within LANL. Wildlife depend on resources (such as wetlands, streams, and rivers) for refuge, foraging habitat, and breeding grounds. LANL has a diverse species index primarily resulting from significant changes in elevation, temperature, and moisture. Regional wildlife includes 57 species of mammals (including large game species such as elk and deer), 200 species of birds, 28 species of reptiles, 9 species of amphibians, and over 1,200 species of arthropods. Additionally, 12 species of fish have been identified in the LANL region in the Rio Grande and in the Los Alamos Reservoir; however, no fish species have been found within LANL boundaries (DOE 2008).

Several animal species occur at LANL, or have the potential to occur at LANL, that are protected by state and federal law. These species include the bald eagle (*Haliaeetus leucocephalus),* the Mexican spotted owl *(Strix occidentalis lucida)*, the southwestern willow flycatcher (*Empidonax traillii extimus*), the yellow-billed cuckoo (*Coccyzus americanus*), the American peregrine falcon (*Falco peregrines anatum*), the Arctic peregrine falcon (*Falco peregrines tundrius*), the northern goshawk (*Accipiter gentilis*), the Jemez Mountains salamander (*Plethodon neomexicanus*), the whooping crane (*Grus americana*), the black-footed ferret (*Mustela nigripes*), and the New Mexico silverspot butterfly (*Speyeria Nokomis mitocris*) (Table 3-2). Several of these individuals occur, or have the potential to occur, in the general vicinity of Sandia Canyon.

Table 3-2. Federal- and State-Protected and Sensitive Species with Potential to Occur in Sandia Canyon at LANL

Common Name	Scientific Name	Status	Potential Occurrence
bald eagle	*Haliaeetus leucocephalus*	ST*	Observed as a migratory and winter resident on adjacent LANL lands. Potential foraging habitat in Sandia Canyon exists.
Mexican spotted owl	*Strix occidentalis lucida*	FT, ST	Breeding and foraging resident on LANL land. Potential nesting and foraging habitat in Sandia Canyon.
southwestern willow flycatcher	*Empidonax traillii extimus*	FE, SE	One individual spotted less than one mile south of Sandia Canyon.
yellow-billed cuckoo	*Coccyzus americanus*	C, NMS	Recorded on the Rio Grande, adjacent to LANL.
American peregrine falcon	*Falco peregrines anatum*	FSC*, ST	Migrant/summer resident that forages on LANL land. Also nests and forages on adjacent lands.
Arctic peregrine falcon	*Falco peregrines tundrius*	FSC*, ST	Habitat requirements not met, but monitored for potential occurrence.
northern goshawk	*Accipiter gentiis*	FSC, NMS	Observed as a breeding resident on Los Alamos County, LANL, Bandelier National Monument, and Santa Fe National Forest lands.
Jemez Mountains salamander	*Plethodon neomexicanus*	C, SE	Permanent resident of Los Alamos County.
black-footed ferret	*Mustela nigripes*	FE	Habitat requirements not met, but monitored for potential occurrence.
New Mexico silverspot butterfly	*Speyeria Nokomis mitocris*	FSC	Habitat exists, though the species has not been documented at LANL.

Source: USFWS 2010, LANL 1998
Note: *Federally delisted due to recovery, currently monitored
Status Codes: FE = Federally Endangered, FT = Federally Threatened, C = Federal Candidate Species, FSC = Federal Species of Concern
SE = State Endangered, ST = State Threatened, NMS = New Mexico Sensitive

Habitat occupied by federally-protected species, or potentially suitable for use by these species, has been delineated within LANL. The 1998 Threatened and Endangered Species Habitat Management Plan mapped Areas of Environmental Interest (AEI) for the bald eagle, the Mexican spotted owl, and the southwestern willow flycatcher. The AEI are designated as either (1) a core area containing important breeding or wintering habitat or (2) a buffer area providing protection from disturbances that would degrade the value of the core area to the species (LANL 1998).

Some populations of the bald eagle, previously listed as federally endangered, have recovered in recent years; however, both the range and population have declined drastically in recent decades. Although bald eagles were recently delisted from the ESA, they are still protected under the *Bald and Golden Eagle Protection Act* of 1984. The bald eagle migrates statewide during the spring and fall, but it generally follows the major river systems of the state. All of LANL is considered potential bald eagle foraging area (LANL 2006a), and bald eagles roost throughout much of White Rock Canyon (LANL 1998); however, no eagle nests have been observed in or near Sandia Canyon and no critical habitat for this species has been designated in the vicinity.

The Mexican spotted owl is a resident and has been confirmed on LANL property. However, due to the implementation of the LANL Threatened and Endangered Species Habitat Management Plan, no LANL property has been designated as critical habitat for this species by the USFWS. Spotted owls occupy mixed conifer forests or ponderosa pine forests, and home ranges for a pair of nesting birds can range from approximately 1,000 to 3,800 acres (405 to 1,538 hectares) (LANL 1998). The owls nest in canyons with nesting beginning in late March or early April. Foraging activities occur in a variety of community types, including open grasslands, ponderosa pine forests, and piñon-juniper woodlands. Core and buffer habitats have been designated in Sandia Canyon 0.5 mi (0.8 km) east of Outfall 001. Additionally, the SERF evaporation ponds on Sigma Mesa lie in the interface of these two areas. Breeding and foraging habitat is present for the Mexican spotted owl in Sandia Canyon and breeding pairs have been observed.

The southwestern willow flycatcher, observed in the U.S. from May until September, breeds in riparian habitats and has been listed as federally endangered since 1995. In New Mexico, the USFWS has designated critical habitat for these songbirds, but it is restricted to river valleys southwest of LANL. The Proposed Action area is not mapped as an AEI for this bird, but core habitat exists in Pajarito Canyon, approximately 2.5 mi (4 km) southeast.

The yellow-billed cuckoo is a federal candidate species documented on the Rio Grande near LANL’s eastern boundary. Its habitat includes open woodlands with clearings and dense scrubby vegetation, often along water. It is likely that the yellow-billed cuckoo occurs at LANL along the Rio Grande; however, no surveys for this species have been performed.

Los Alamos County is within the foraging range for the American peregrine falcon and contains suitable habitat. Several nesting areas are located in the LANL region; however, the peregrine falcon has been delisted due to recovery but is still monitored. Arctic peregrine falcons are considered rare migrants in New Mexico, verified only in the Roswell area. Because of its similarity in appearance to the American peregrine falcon, the Arctic peregrine falcon was also granted protection. It is now delisted due to recovery but is still monitored long term.

The northern goshawk has been identified as breeding in Los Alamos County and potentially breeding on LANL property in Water Canyon. Habitat associations for the northern goshawk include various forest types, especially mature forest. Habitat is mapped near the northern boundary of LANL. Based on habitat modeling, the northern goshawk is not likely present in the canyon bottom of the upper end of Sandia Canyon.

The Jemez Mountains salamander is an endemic amphibian to New Mexico, and it is only found in three counties, including Los Alamos. The natural habitat of the Jemez Mountains salamander is temperate forests. This salamander, whose restricted range is limited to north-facing coniferous forests above 7,200 ft (2,200 m), is threatened by increased habitat loss. The Jemez Mountains salamander is not likely present in the canyon bottom in the upper end of Sandia Canyon.

Black-footed ferrets, considered the rarest mammals in North America, have not been sighted in New Mexico since 1934. They reside in large prairie dog colonies, feeding on these and other small mammals. If not already extirpated in New Mexico, likely sightings would occur mostly in the northwestern portion of the state, which includes Los Alamos County; however, no large prairie dog colonies exist within LANL that could support black-footed ferrets.

The New Mexico silverspot butterfly is a federal species of concern. Primary habitat associations for this species include alpine meadows. Within LANL, habitat exists for the New Mexico silverspot butterfly, though the species has not been documented at LANL.

Migratory birds, as listed in 50 CFR 10.13, are protected under the *Migratory Bird Treaty Act* of 1918 (16 U.S.C. 703–712) as amended and EO 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds*. Numerous migrant species use the various habitats at LANL as a migratory stopover habitat or for breeding.

3.5 CULTURAL RESOURCES

Cultural resources include prehistoric and historic archaeological sites, structures, districts, or areas containing physical evidence of human activity. Such resources can also be traditional cultural properties (TCPs), which retain cultural and religious significance to modern groups. These resources are protected and identified under several federal laws and executive orders. The federal laws include the *National Historic Preservation Act* (NHPA) (1966), the *Archaeological and Historic Preservation Act* (1974), the *American Indian Religious Freedom Act* (1978), the *Archaeological Resources Protection Act* (1979), and the *Native American Graves Protection and Repatriation Act* (NAGPRA) (1990).

The NHPA requires that federal agencies assume the responsibility for the preservation of historic and prehistoric resources located on lands owned or controlled by that agency. Section 110 (a)(2) of the NHPA requires that "... each Federal agency shall establish a program to locate, inventory, and nominate to the Secretary all properties under the agency's ownership or control ... that appear to qualify for inclusion on the National Register ..." Section 110 (a)(2) further requires that "Each agency shall exercise caution to assure that any property that might qualify for inclusion is not inadvertently transferred, sold, demolished, substantially altered, or allowed to deteriorate significantly." These requirements are also included in DOE Policy 141.1, *Department of Energy Management of Cultural Resources*. At LANL, NHPA compliance is conducted under the DOE-approved Cultural Resources Management Plan (CRMP), which is an institutional comprehensive plan that defines responsibilities, requirements, and methods for managing cultural resources on DOE-administered lands (LANL 2006b).

Under NHPA guidelines, cultural resources, including buildings, structures, objects, sites, and districts, are to be evaluated for NRHP eligibility using the NRHP Criteria for Evaluation, as listed in 36 CFR 60.4. To be listed in, or considered eligible for the NRHP, a cultural resource must be 50 years or older (except in the case of highly significant recent resources) and possess at least one of the four following criteria:

- Criterion A. The resource is associated with events that have made a significant contribution to the broad pattern of history.
- Criterion B. The resource is associated with the lives of people significant in the past.

- Criterion C. The resource embodies distinctive characteristics of a type, period, or method of construction; represents the work of a master; possesses high artistic value; or represents a significant and distinguishable entity whose components may lack individual distinction.
- Criterion D. The resource has yielded, or may be likely to yield, information important in prehistory or history.

In addition to meeting at least one of these criteria, a cultural resource must also possess integrity of location, design, setting, materials, workmanship, feeling, and association. Integrity is defined as the authenticity of a property's historic identity, as evidenced by the survival of physical characteristics it possessed in the past and its capacity to convey information about a culture or group of people, an historic pattern, or a specific type of architectural or engineering design or technology.

Location refers to the place where an event occurred or a property was originally built. Design considers elements such as plan, form, and style of a property. Setting is the physical environment of the property. Materials refer to the physical elements used to construct the property. Workmanship refers to the craftsmanship of the creators of a property. Feeling is the ability of the property to convey its historic time and place. Association refers to the link between the property and an historically significant event or person.

Cultural resources meeting these standards (age, eligibility, and integrity) are termed "historic properties" under the NHPA. Sites or structures not considered individually significant may be considered eligible for listing in the NRHP as part of an historic district. According to the NRHP, an historic district possesses a significant concentration, linkage, or continuity of sites, buildings, structures, or objects that are historically or aesthetically united by plan or physical development.

Typically, cultural resources are grouped into three separate categories—archaeological, architectural, or TCPs. Archeological resources are defined as areas that have altered the landscape. Architectural resources are built structures of significance. These architectural resources are typically more than 50 years old, but newer structures can be evaluated under the four cultural resource criteria. TCPs are sites of traditional, religious, or cultural significance to Native American tribes and can include architectural and/or archaeological resources, sacred sites, neighborhoods, geographic landmarks, flora or faunal habitats, mineral localities, or sites considered essential for the preservation of traditional culture.

Under Section 106 of the NHPA, federal agencies must consider the effect of their undertakings on historic properties and allow the Advisory Council on Historic Preservation (ACHP) an opportunity to comment. Under this process, the federal agency evaluates the NRHP eligibility of resources within the proposed undertaking's Area of Potential Effect (APE) and assesses the possible effects of the proposed undertaking on historic resources in consultation with the State Historic Preservation Officer (SHPO) and other parties. The APE is defined as the geographic area(s) "... within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist." Under Section 110 of the NHPA, federal agencies are required to establish programs to inventory and nominate cultural resources under their purview to the NRHP.

Current understanding of the history and prehistory of what is now LANL is derived from archival data, data collected during archaeological surveys, and limited test and block excavations as well as information resulting from comparisons of data from LANL with data from other parts of northern New Mexico. As of 2005, approximately 90 percent of the land within LANL boundaries had been surveyed for cultural resources.

These survey efforts have identified 1,915 archaeological resource sites. A total of 1,776 of these sites are prehistoric resources relating to the Paleoindian, Archaic, and Ancestral Pueblo periods. The remaining 139 sites are historic-period resources associated with the American Indian, Hispanic, and Euro-American cultures and dating to the years since AD 1600. Approximately 400 of these archaeological resource sites have been formally determined eligible for listing on the NRHP; most of the remaining sites have not been formally evaluated for eligibility and are assumed eligible until a formal determination is made.

LANL and DOE staff had consulted with a total of 26 American Indian tribes to determine which had active TCP concerns involving LANL land. This process identified three tribes—the Pueblo of San Ildefonso, the Pueblo of Santa Clara (Rendija Canyon), and possibly the Pueblo of Cochiti—as having active TCP concerns. This ongoing process has resulted in the identification of one TCP. However, there are likely numerous TCPs present over LANL that have not been specifically identified by Pueblo members as such. While the affect of LANL mission activities on the TCPs is unknown to LANL and DOE personnel, it is expected that some TCPs on LANL land are affected to some degree by LANL structures, mission activities, and other operations (LANL 2006b).

3.5.1 SERF

No archaeological resource sites exist in TA-3 in the vicinity of the SERF, the SCC, the LDCC, and the Power Plant, although an established TCP is located a short distance north of the LDCC. At least four archaeological resource sites are located within approximately 250 ft (76 m) of the TA-60 evaporation ponds on Sigma Mesa. The SHPO has concurred that two of these sites—a possible trail and a territorial- to U.S. statehood-period reservoir—are not eligible for listing on the NRHP. One prehistoric site (a one- to three-room Ancestral Pueblo structure) and one Homestead-era ranch site (a structure foundation, mound, and tank) have SHPO concurrence as NRHP-eligible.

Four archaeological resource sites have been recorded within approximately 250 ft (76 m) of the SWWS Plant. Two of these sites—an Archaic-period lithic scatter and the Homestead-period Pajarito Wagon Road—have SHPO concurrence as no longer NRHP-eligible. A second Archaic-period lithic scatter has not yet been registered with the SHPO and does not have an eligibility determination. One site—a Coalition-period artifact scatter—has SHPO concurrence as NRHP-eligible.

3.5.2 Reach S-2

Three archaeological resource sites have been recorded within approximately 250 ft (76 m) of the upper end of Sandia Canyon. One site is a stairway that the SHPO judged as undetermined NRHP eligibility. The other two sites determined eligible to the NRHP are an historic wagon road segment and a one- to three-room structure dating to the late Coalition to early Classic period. A fourth archaeological resource site approximately 275 ft (84 m) from the upper end of the Sandia Canyon area is an Ancestral Pueblo-period cavate and game pit that the SHPO has determined NRHP-eligible.

3.6 AIR QUALITY

The CAA establishes air quality standards for criteria air pollutants, hazardous air pollutants, and other toxic air pollutants to protect public health and the environment from the harmful effects of air pollution. Air quality is a measure of the amount and distribution of potentially harmful pollutants in ambient air. Criteria air pollutants are those listed in National Primary and Secondary Ambient Air Quality Standards (40 CFR 50). Hazardous air pollutants are those listed in Title I of the CAA and those regulated by the National Emissions Standards for Hazardous Air Pollutants (40 CFR 61). The CAA applies to new stationary sources of emissions and any modified structure that emits or may emit an air pollutant. To prevent a significant deterioration in air quality, the CAA additionally requires evaluation of specific emission increases, especially in consideration of Bandelier National Monument—a federally designated Class I area under the CAA which borders LANL on the south and east.

Under the CAA, the EPA developed numerical concentration-based standards, called National Ambient Air Quality Standards (NAAQS), for pollutants determined to affect human health and the environment. The NAAQS represent the maximum allowable concentrations for the following six criteria pollutants (40 CFR Part 50):

- Ozone (O3) measured as volatile organic compounds (VOCs) or total nitrogen oxides (NOx)
- Carbon monoxide (CO)
- Nitrogen dioxide (NO2)
- Sulfur oxides (SOx)
- Respirable particulate matter (including particulate matter equal to or less than 10 microns in diameter [PM10] and particulate matter equal to or less than 2.5 microns in diameter [PM2.5])
- Lead (Pb)

The CAA also gives the authority to states to establish air quality rules and regulations. The EPA is the regulating authority for the CAA; however, the EPA has granted NMED primacy for regulating non-radioactive air emissions under an approved State Implementation Plan (SIP). With the exception of the National Emission Standards for Hazardous Air Pollutants for radionuclides (40 CFR 61), provisions of the Stratospheric Ozone Protection section (40 CFR 82), and the Risk Management Program (40 CFR 68), New Mexico has adopted all CAA regulations as part of the SIP. The SIP is regulated under the *New Mexico Air Quality Control Act*.

The EPA classifies the air quality in an air quality control region (AQCR) or in subareas of an AQCR, according to whether the concentrations of criteria pollutants in ambient air exceed the NAAQS. Areas within each AQCR are designated as attainment, nonattainment, maintenance, or unclassified for each of the six criteria pollutants.

- Attainment means the air quality within an AQCR is better than the NAAQS.
- Nonattainment indicates criteria pollutant levels exceed NAAQS.
- Maintenance indicates an area was previously designated nonattainment but is now designated as attainment.
- Unclassified means not enough information exists to appropriately classify an AQCR as attainment.

The EPA has delegated the authority for ensuring compliance with the NAAQS to NMED. LANL has been determined in attainment for the six criteria pollutants.

Work at LANL is performed in accordance with federal, state, DOE, LANL, and local regulations as required by the CAA and the NMED SIP. Air surveillance is conducted in and around LANL to determine the air quality effects of LANL operations. LANL staff calculate actual annual LANL emissions of regulated air pollutants and report the results annually to NMED in an Emissions Inventory Report. The ambient air quality in and around LANL meets all state, EPA, and DOE standards for protecting the public and workers (LANL 2009a).

Under New Mexico air quality requirements, excavation and construction activities and equipment are not considered stationary sources of regulated air pollutants. Therefore, these activities are not subject to permitting under 20 NMAC, Parts 2.70 and 2.72. This exemption does not require notification to NMED because NMED does not regulate dust and other emissions from excavation or construction activities and equipment. However, LANL workers take appropriate steps during construction activities to control fugitive dust emissions using best achievable control measures. Annual dust emissions from daily windblown dust are generally higher than short-term, construction-related dust emissions. Mobile sources, such as automobiles, are additional sources of air emissions; however, NMED does not regulate mobile sources.

3.7 NOISE

Although human response to noise varies, instruments that record instantaneous sound levels in decibels can calculate more precise measurements. The decibel unit weighted as A (dBA) characterizes sound levels the human ear can hear. A-weighted indicates the frequency range is adjusted to what the average human ear can sense when experiencing an audible event. Clinical hearing assessments have shown the threshold of audibility for normal hearing falls within a range of 10 to 25 dBA. The threshold of pain occurs at the upper boundary of audibility, which is normally in the region of 135 dBA (EPA 1981a).

Table 3-3 compares common sounds and shows how they rank in terms of the effects of hearing. A whisper (normally 30 dBA) is considered very quiet. An air conditioning unit 20 feet away (at 60 dBA) is considered an intrusive noise. Noise levels can become annoying at 80 dBA and very annoying at 90 dBA. Each 10 dBA increase seems twice as loud to the human ear (EPA 1981b).

Table 3-3. Sound Levels and Human Response

Noise Level (dBA)	Common Sounds	Effect
10	Just audible	Negligible
30	Soft whisper (15 feet)	Very quiet
50	Light auto traffic (100 feet)	Quiet
60	Air conditioning unit (20 feet)	Intrusive
70	Noisy restaurant or freeway traffic	Telephone use difficult
80	Alarm clock (2 feet)	Annoying
90	Heavy truck (50 feet) or city traffic	Very annoying Hearing damage (8 hours)
100	Garbage truck	Very annoying
110	Pile drivers	Maximum vocal effort
120	Jet takeoff (200 feet) or auto horn (3 feet)	Maximum vocal effort
140	Carrier deck jet operation	Painfully loud

Source: EPA 1981b

Under the *Noise Control Act* of 1972, the Occupational Safety and Health Administration (OSHA) established workplace standards for noise. The minimum requirement states that constant noise exposure must not exceed 90 dBA over an 8-hour period. The highest allowable sound level to which workers can be constantly exposed is 115 dBA and exposure to this level must not exceed 15 minutes within an 8-hour period. Standards limit instantaneous exposure, such as impact noise, to 140 dBA. If noise levels exceed these standards, employers are required to provide hearing protection equipment that reduces sound levels to acceptable limits (29 CFR Part 1910.95).

Building demolition and construction work can cause an increase in sound that is well above the ambient level. A variety of sounds are emitted from loaders, trucks, saws, and other work equipment. Table 3-4 lists noise levels associated with common types of construction equipment. Construction equipment usually exceeds the ambient sound levels by 20 to 25 dBA in an urban environment and up to 30 to 35 dBA in a quiet suburban area.

Royal Crest Mobile Home Park is located about 1,250 ft (381 m) to the east of reach S-2. Daytime ambient sound levels in Sandia Canyon range from about 33 to 58 dBA. Noise from heavy machinery usually attenuates to background levels over about one quarter mile (1,320 ft) (402 m), so daytime noise levels from construction activities at LANL may occasionally exceed 65 dBA at Royal Crest Mobile Home Park.

3.8 HUMAN HEALTH

The health of LANL workers is routinely monitored depending upon the type of work performed. Health monitoring programs for LANL workers consider a wide range of potential concerns, including exposures to hazardous chemicals and routine workplace hazards. In addition, LANL workers involved in hazardous operations are protected by engineering controls and workers are required to wear appropriate PPE. Training is also required to identify and avoid or correct potential hazards typically found in the work environment and to respond to emergencies.

Table 3-4. Predicted Noise Levels for Construction Equipment

Construction Category and Equipment	Predicted Noise Level at 50 feet (dBA)
Clearing and Grading	
Bulldozer	80
Grader	80–93
Truck	83–94
Roller	73–75
Excavation	
Backhoe	72–93
Jackhammer	81–98
Building Construction	
Concrete mixer	74–88
Welding generator	71–82
Pile driver	91–105
Crane	75–87
Paver	86–88

Source: EPA 1971

All work performed at LANL is subject to the Integrated Safety Management System. This is a five-step process that defines a systematic approach to actions taken before, during, and after work is performed. Because of the various health monitoring programs, requirements for PPE, and routine health and safety training, LANL workers are generally considered a healthy workforce with a below-average incidence of work-related injuries and illnesses.

3.9 UTILITIES AND INFRASTRUCTURE

Utilities and infrastructure include electricity, water, sanitary sewers, natural gas, and communications. Major utility corridors in TA-3 occur along Pajarito Road and Mercury Road (DOE 1998). The SERF is located in an area with a considerable amount of other LANL infrastructure and utility support activities.

The TA-3 Power Plant is capable of providing additional electrical power up to 20MW (DOE 2008). The total electrical load summary for the SERF, as constructed, is 637 kVA (LANL 2002). No natural gas is used at the SERF (LANL 2010b).

LANL currently obtains its potable water from the Los Alamos water production system. In 2005, LANL used about 359.3 million gal. (1,360 million L) of potable water. Cooling towers have used approximately 60 percent of potable water at LANL (DOE 2008). Approximately 50 percent of cooling tower water is lost as result of blowdown, which includes compounds regulated by LANL's NPDES permit (Wingo 2010b). The existing SERF has the capability of reducing up to 100,000 gal./d (379,000 L/d) of potable water consumption at LANL via its treatment and reuse of sanitary effluent from the SWWS Plant (Wingo 2010b).

LANL's NPDES permit regulates sanitary and industrial effluent from outfalls. In 2008, LANL discharged approximately 158.4 million gal. (600 million L) of effluent from its permitted outfalls. In 2008, Outfall 001 discharged about 14.79 million gal. (55.98 million L) of effluent to Sandia Canyon, providing a ready source of effluent (LANL 2009a).

Communication corridors provide secure and nonsecure telephonic and other communication capabilities in TA-3 and elsewhere at LANL (DOE 1998).

3.10 TRAFFIC AND TRANSPORTATION

Regional highways and NNSA-administered site roads serve as the primary means of gaining access to LANL and adjacent areas in the Los Alamos town site and Los Alamos County. U.S. Highway 84/285 and State Road (SR) 502 provide public access from Santa Fe, with SR 4 providing access from White Rock. Pajarito Road, East Jemez Road, West Jemez Road, and Diamond Drive provide access to TA-3, where the SERF is located. Within TA-3, vehicles can access the SERF from Diamond Drive and then from Eniwetok Drive (DOE 2002, 2008).

Many vehicles travel to LANL on a daily basis. Studies in 2004 and 2005 determined that the traffic flow at LANL's five main access points totaled 42,296 average daily vehicle trips (DOE 2008).

No paved roads or recreational trails exist in reach S-2 (Pava 2010a, 2010b). An unpaved, pipeline service road, once present in the upper part of reach S-2, is now overgrown and is no longer passable by vehicles.

3.11 ENVIRONMENTAL RESTORATION AND WASTE MANAGEMENT

3.11.1 Environmental Restoration

DOE and LANS staff are jointly responsible for implementing environmental restoration activities at LANL, which is a permitted *Resource Conservation and Recovery Act* (RCRA) hazardous waste facility. Environmental restoration at LANL is governed primarily by the corrective action process prescribed in the Consent Order, but is also subject to other applicable laws, regulations, DOE orders, and LANL policies. NMED administers the RCRA in New Mexico. DOE, through the NNSA Los Alamos Site Office, oversees site characterization and waste cleanup and restoration activities at LANL sites.

Environmental restoration activities at LANL sites, including investigation and remediation activities, are subject to the Consent Order. Contamination in canyon bottoms and in groundwater is being investigated on a watershed basis between the possible sources and the Rio Grande. Aggregate Areas are areas within a single watershed or canyon made up of one or more solid waste management units (SWMUs) or areas of concern (AOCs). SWMUs and AOCs in the vicinity of the SERF are under investigation as part of the Upper Sandia Canyon Aggregate Area (LANL 2008c). Sandia Canyon sediments and groundwater are under investigation as part of the Sandia Canyon Watershed (LANL 2009c).

The Sandia Canyon investigation report determined that the most important sediment deposition area is in the upper canyon where a broad wetland exists (reach S-2). This area contains approximately 80 to 90 percent of the inventory of chromium and PCBs within Sandia Canyon sediment deposits. Investigation is ongoing to determine the extent of contaminant transport to date and the range of potential effects, although preliminary information indicates that the levels of contaminants transported downstream from reach S-2 are relatively low.

Corrective action units at LANL include SWMUs and AOCs, which are current and former structures or operational areas where contaminants are known or suspected to have been released to the environment. SWMUs and AOCs at LANL include septic tanks and lines, chemical storage areas, wastewater outfalls (the area below a pipe that drains wastewater), landfills, firing ranges and their impact areas, surface spills, and soil contamination areas. These sites are found on mesa tops, on canyon walls, and in canyon bottoms.

The main pathways by which released contaminants can migrate are infiltration into surface soils, bedrock, and alluvial aquifers; airborne dispersion of dust or particulate matter; and migration with surface water runoff. The environmental contaminants at LANL include metals and other inorganic chemicals, PCBs, pesticides, petroleum products, SVOCs, VOCs, high explosive compounds, and radionuclides. The 2008 LANL SWEIS (DOE 2008) contains additional information about LANL contaminants.

SWMUs located in the vicinity of the SERF include: legacy sludge drying beds designated as SWMU 03-014(o) located east of the existing building; and an inactive trickling filter designated as SWMU 03-014(c) and adjacent to SWMU 03-014(g), also an inactive trickling filter. Neither reach S-2, nor any area within its boundaries is a SWMU or an AOC. However reach S-2 is part of AOC C-00-007 (which encompasses all of Sandia Canyon). Chapter 4 discusses the extent to which the expanded SERF and environmental restoration alternatives affect these SWMUs.

3.11.2 Waste Management

A wide range of waste types are generated through activities on LANL property related to research, production, maintenance, construction, decontamination, decommissioning, demolition, and environmental restoration. These waste types include wastewaters (sanitary liquid waste, high explosive-contaminated liquid waste, and industrial effluent); solid (sanitary) waste, including routine household-type waste, construction debris, and demolition debris; and radioactive and chemical wastes. These wastes are regulated by federal and state regulations, applicable to specific waste classifications.

LANL’s Environmental Management System is the basis for institutional requirements for waste management activities. This program provides details on proper management of all process wastes and contaminated environmental media. The waste management operation tracks the waste-generating process, quantity, chemical and physical characteristics, regulatory status, applicable treatment and disposal standards, and final disposition of the waste (LANL 2004b). Management of all waste at LANL is carried out in accordance with applicable laws, regulations, and DOE orders.

A significant portion of waste management operations take place in facilities designed for and dedicated to waste management. Liquid wastes are treated at the SWWS Plant, the HEWTF at TA-16, and the RLWTF at TA-50. Specialized facilities in TA-50 and TA-54 house a variety of chemical and radioactive waste management operations, including size reduction, compaction, assaying, and storage. Many hazardous wastes are now accumulated for up to 90 days at consolidated storage facilities and then shipped directly off-site. Four of these consolidated storage facilities exist at LANL and two more are planned (LANL 2003)

Waste minimization and pollution prevention efforts at LANL are coordinated by the Pollution Prevention Program. Source reduction, including materials substitution and process improvements, is the preferred method of reducing waste. Recycling and reuse practices are also considered for wastes along with volume reduction and treatment options. Progress in pollution prevention initiatives at LANL is measured annually against metrics approved by the DOE (LANL 2004c). The 2008 LANL SWEIS (DOE 2008) contains additional information about LANL waste management operations.

CHAPTER 4

4.0 ENVIRONMENTAL CONSEQUENCES

This chapter provides discussion of the various impacts identified by alternatives for the SERF expansion project and for the potential bounding environmental restoration action measures. Where mitigation actions beyond those attributes that are inherently a part of the proposed action alternatives for SERF and the bounding alternatives for environmental restoration have been identified, these have been included in the discussions by resource area. A Mitigation Action Plan is included in Appendix B of this EA for all the mitigation actions discussed in the text. Table 4-1, Summary of Environmental Consequences for SERF and ER Alternatives, is provided at the end of this chapter. This table summarizes impacts by the six alternative actions analyzed in the EA and describes how to use the table to consider the different possible combinations of alternatives that could be selected for implementation by the different decision entities, DOE and NNSA, and NMED.

4.1 SERF ALTERNATIVES

4.1.1 No Action—SERF

4.1.1.1 Geology and Soils

Under the No Action Alternative for the SERF, the existing facility would remain in place and operate as originally intended. No potential effects on geology and soils would be expected.

4.1.1.2 Water Resources

Under the No Action Alternative, the SERF will treat approximately 100,000 gal./d (379,000 L/d) of SWWS Plant effluent for reuse purposes. The remainder of the SWWS Plant effluent will continue to be discharged to Sandia Canyon via Outfall 001 without additional treatment. The discharge from Outfall 001 will not meet the more stringent NPDES effluent limitations for PCBs, and LANL would be in violation of its NPDES permit when those requirements go into effect in July 2012, unless NNSA and LANS renegotiate the permit.

Discharged wastewater will continue to flow through reach S-2 of Sandia Canyon, and it will likely maintain saturated soil and sediment at or near current conditions. The saturated sediment conditions and wetland vegetation in the lower half of reach S-2 help stabilize the contaminants. This helps to keep the contaminants from being transported downcanyon. However, stormwater runoff moves quickly through reach S-2; erosion of contaminated sediment at the eastern end of reach S-2 would be expected to continue under the No Action Alternative. The area of erosion is immediately above a sampling station at gage E123 and water quality standards for PCBs in stormwater will not always be met under the No Action Alternative. Long-term erosion could result in a reduction or loss of wetland conditions and increased stream channelization.

4.1.1.3 Ecological Resources

Under the No Action Alternative for the SERF expansion project, the SERF upgrades would not be constructed and no changes would occur to current ecological resources as described in Section 3.4. The existing facility will remain in place and operate as originally intended. No impacts on ecological resources would be expected from the selection of the No Action Alternative. However, continued erosion may occur dependent upon actions taken within reach S-2 pursuant to the Consent Order. This continued erosion would result in further reduction of wetland acreage due to hydrologic alteration. To the extent that wetland acreage is reduced, impacts on the vegetation and wildlife habitat typically found within the wetland could occur. Wetland vegetation may be replaced by non-wetland type plants.

4.1.1.4 Cultural Resources

Under the No Action Alternative, the SERF expansion at TA-3, as well as the additional storage lagoon at TA-46 and additional evaporation ponds at TA-60, would not be constructed. Historic structures or archaeological resource sites in the vicinity of these areas would not be affected.

4.1.1.5 Air Quality

No change to the air quality in the Los Alamos area would be expected under the No Action Alternative because the SERF process does not result in any substantial air emissions. No construction, additional vehicle traffic, or heavy machinery use would occur under the No Action Alternative.

4.1.1.6 Noise

Under the No Action Alternative, noise levels at the SERF would remain the same at about 33 to 58 dBA, with no change in the amount of noise generated from existing operations and maintenance activities.

4.1.1.7 Human Health

No change to human health effects are expected under the No Action Alternative for the SERF. The planned operating conditions for the SERF in its current configuration include the presence of a single full-time operator, with occasional support staff for routine maintenance of the facility or for repairs to the building or equipment. No additional operational or construction activities would be involved and no impacts on human health would be expected from the No Action Alternative.

4.1.1.8 Utilities and Infrastructure

Under the No Action Alternative, utilities and infrastructure at the SERF would remain the same or with minimal change in the amount of electricity and water use as well as effluent reused or discharged. No impacts on the amount or type of utilities and infrastructure would be expected from the No Action Alternative.

4.1.1.9 Traffic and Transportation

Under the No Action Alternative, no change is anticipated in traffic and transportation at the SERF. No impacts on the amount or type of traffic and transportation needs would be expected from the No Action Alternative

4.1.1.10 Environmental Restoration and Waste Management

Under the No Action Alternative, the SERF would not be expanded from its current configuration. No construction activities would be required and SWMUs 03-014(o), 03-014(c), and 03-014(g), located east and southeast of the SERF, would not be affected. Waste generation amounts and types would remain consistent with the estimates made for operating the facility as it was originally intended under the No Action Alternative. No impacts on environmental restoration and waste management activities would be expected under the No Action Alternative.

4.1.2 Partial Reuse Alternative

4.1.2.1 Geology and Soils

Potential effects on geology and soils from implementing the Partial Reuse Alternative would be the same or very similar to those expected for the No Action Alternative. Under the Partial Reuse Alternative, the SERF would be expanded to include construction of two or three 500,000-gal. (1,893,000-L) water storage tanks directly east or southeast of the existing SERF building, and an additional 800,000-gal. (3,032,000-L) wastewater storage tank or lagoons with equivalent capacity at TA-46. The footprint of the SERF building would be expanded by approximately 2,000 ft^2 (93 m^2). Laydown materials and equipment areas would disturb about 1.5 acres (0.6 hectares), and pipeline construction actions would require the disturbance of about 0.5 acres (0.2 hectares) of soil during the trenching processes.

The expanded building footprint and additional water and wastewater storage tanks would be located on bedrock much like the existing SERF building (LANL 1999a). A total of about 5 acres (2 hectares) of soil disturbance would occur from all construction activities if this alternative were implemented.

4.1.2.2 Water Resources

Under the Partial Reuse Alternative, the expanded SERF would provide up to 100 percent of the cooling water demands of the SCC and would reduce by up to 75 percent the discharge of treated effluent to Sandia Canyon. Potable groundwater use in the SCC cooling towers would be reduced by up to 324,000 gal./d (1.226 million L/d) due to the offsetting reuse of treated wastewater.

The application of engineering BMPs to address stream water quality impacts by stormwater runoff is required under LANL's NPDES Multisector General Permit for stormwater discharges. BMPs developed as part of the SWPPP would manage stormwater during and after construction so that no impacts would be expected from the activities that are part of the Partial Reuse Alternative. Restabilization and revegetation of disturbed areas following construction, along with other BMPs to abate runoff and wind erosion, would reduce or eliminate potential impacts of soil erosion and stormwater runoff or run-on.

It is unlikely that the regional aquifer groundwater quality would be adversely affected by a reduction in treated effluent discharged to upper Sandia Canyon. The regional drinking water aquifer occurs at depths of approximately 1,200 ft (365 m) below the mesa top where the expanded SERF would be located. No perched-intermediate groundwater has been identified beneath either the SERF or reach S-2 areas.

Currently, the shallow alluvial groundwater level is effectively the surface water level within the lower half of reach S-2. The water level could decrease over time in reach S-2 as a result of the Partial Reuse Alternative, resulting in loss of wetland acreage. Stormwater and snowmelt would continue to enter the upper end of reach S-2 and may serve to augment the shallow groundwater in the lower portion of reach S-2. Adaptive resource management practices would be employed to monitor water levels in the lower portion of reach S-2 and to adjust the volume of effluent discharge to maintain saturated conditions as required. The amount of treated, back-blended effluent released via Outfall 001 could be increased either temporarily or permanently, as deemed necessary to maintain desired site conditions. NPDES permit limitations for PCBs would be met.

4.1.2.3 Ecological Resources

Ground disturbance and noise associated with construction activities from implementing the Partial Reuse Alternative might directly or indirectly cause potential effects on ecological resources. No direct impacts on the Sandia Canyon floodplains are anticipated from implementing the Partial Reuse Alternative. A relatively minor increase in impervious surfaces at the SERF has the potential to increase surface water runoff, but the increase in flood potential would be negligible.

Short- and long-term, minor adverse impacts on the Sandia Canyon wetland would be expected from implementing the Partial Reuse Alternative. The SERF upgrades would reduce the volume of treated effluent discharged to the wetlands by up to 75 percent. No direct fill activities are associated with the Partial Reuse Alternative; however, indirect effects could result in reduced flow and would likely result in a reduction of the wetland size or its elimination. Species composition and the wetland habitat would eventually shift to species adapted to drier, upland conditions similar to the surrounding area.

Implementation of mitigations to address adverse impacts through adaptive resource management practices would allow adjustments to the volume of water released to the wetland in conjunction with monitoring the wetland habitat. Adjusting the effluent volumes could result in maintenance of the wetland vegetation and the wildlife that support it as deemed appropriate.

Given that the effluent contributes approximately 75 percent of the total surface water flow within the canyon (LANL 2008b), it is likely that either of the SERF project action alternatives could result in a reduction of the wetland area—even with the grade control structure in place. However, in the event that the 3-acre (1.2-hectare) wetland area is eliminated by the reduction in effluent, it would represent less than 10 percent of the total wetland areas identified in the 2005 delineation of LANL wetland acreage.

The loss of wetland acres would be mitigated through the implementation of wetland restoration or enhancement, or through the participation in a mitigation bank or in-lieu of fee mitigation agreements, as appropriate, under the provisions of the Mitigation Action Plan. Additionally, adherence to SWPPPs would minimize surface water degradation within reach S-2. Appropriate BMPs would be implemented during construction activities and no direct or indirect impacts on surrounding wetlands would be expected. In the event of a spill or leak of fuel, hydraulic fluid, or other construction-related hazardous material, all spills would be contained and cleaned up quickly in accordance with an approved spill prevention, control, and countermeasure plan;

therefore, no impacts on the nearby wetland within Sandia Canyon reach S-2 from spills of hazardous materials are anticipated.

Implementation of the Partial Reuse Alternative would be expected to result in clearing of vegetation at various construction areas. The majority of vegetation surrounding the SWWS Plant, the SCC, the LDCC, the TA-3 Power Plant, and the SERF is modified, landscaped, and mowed regularly. However, native vegetative communities occurring in the vicinity of the TA-60 evaporation ponds would be permanently removed from about 2 acres (0.8 hectares) of land for the construction of new evaporation ponds. Cleared areas that were not sites of permanent construction actions would be expected to regenerate or be replanted upon completion of construction activities. Because no observations have been made of any unique native or sensitive vegetative species occurring within the project areas, no impacts on sensitive species would be expected.

Direct, short-term, minor adverse effects on wildlife due to disturbances (such as noise and motion) from construction activities and heavy equipment use would occur from implementing the Partial Reuse Alternative. High noise events could cause wildlife to flee or avoid sites, resulting in short-term, minor adverse effects. The areas of construction-related activities would be relatively small in size relative to available wildlife habitat areas at LANL, and the proposed construction activities would generally be within developed areas where sound, light, and motion disturbances are common (such as grounds mowing, landscaping, and foot and vehicle traffic). Most wildlife species in the proposed project vicinity would be expected to quickly recover after the noise and disturbances from construction have ceased for the day, or to habituate to the noises; therefore, no long-term adverse effects on wildlife would be expected as a result of these temporary disturbances. Mitigation measures for game animals and other small mammals and birds would include BMPs, such as re-seeding disturbed areas with a native seed mix and then monitoring the sites and re-seeding them as necessary to achieve at least 50 percent vegetation coverage (see Appendix B). This mitigation measure would result in the recovery of wildlife habitat that would otherwise be lost to use by various animals.

A few federally-listed threatened or endangered species are known to occur at LANL and one of these species, the Mexican spotted owl, has the potential to occur in the SERF project areas. However, no mating pairs occupied the area of potential habitat during the 2010 breeding season. Construction activities for the expansion of the evaporation ponds on Sigma Mesa may remove about 2 acres (0.8 hectares) of potential core habitat due to the removal of mature trees greater than 9 inches (23 cm) in diameter at breast height. The affected area of about 2 acres (0.8 hectares) represents less than one percent of the AEI. While this would be a permanent effect, it would not likely adversely affect the potential habitat for the Mexican spotted owl in this AEI. Additional effects on this potential habitat would be expected from temporary noise and motion disturbance during construction activities. Mitigation actions identified in the Mitigation Action Plan for threatened or endangered species include the implementation of all reasonable and prudent measures identified during the consultation process with the USFWS, which would be completed prior to implementing any activities. The mitigation actions also would include following the LANL Threatened and Endangered Species Habitat Management Plan provisions on noise generation, erosion and runoff controls, and nighttime lighting. Implementing these mitigation measures would moderate short term construction related noise, erosion and lighting, and long-term impacts related to night-time site lighting at the SERF structures.

Additionally, if construction actions were to begin before the 2011 breeding season—from March 1 through August 31—construction could continue undisturbed to completion. If construction initiation is delayed until the breeding season commences, a survey for the species would need to be conducted before work initiation. If a breeding pair of Mexican spotted owls are occupying the site, construction work would be delayed until the end of the breeding season.

Construction associated with the SERF expansion would be conducted in a manner to avoid adverse impacts on migratory birds to the extent practicable. No measurable long-term adverse impacts on migratory birds are anticipated. However, short-term, negligible to minor adverse effects on migratory birds could be expected from visual and noise disturbances during construction activities. These impacts, most likely in the form of escape or avoidance behaviors, are anticipated to be temporary.

4.1.2.4 Cultural Resources

The planned expansion of the SERF (including piping, lift stations, storage tanks, and other actions) may affect potentially eligible historic buildings and structures. Any such structures in the affected area would be identified in consultation with LANL cultural resources managers and would be evaluated for potential NRHP eligibility. Before construction activities begin, any adverse effects to potentially eligible structures would be mitigated through Historic American Buildings Survey (HABS) documentation and an Historic Cultural Properties Inventory (HCPI) form.

No archaeological sites have been recorded in the immediate vicinity of the SERF project area. At least four archaeological resource sites are located within approximately 250 ft (76 m) of the TA-60 evaporation ponds, where planned activity would involve doubling the size of the existing ponds. Two of these resource sites have been determined NRHP-eligible by the SHPO. These sites are close enough to the proposed zone of disturbance that consultation with the SHPO would be required to obtain a no effect through avoidance determination for the undertaking; this mitigation measure is included in the Mitigation Action Plan, along with following other provisions of the LANL CRMP. In the event that any buried archaeological resource, remains, or items of cultural significance are encountered during construction, site activities would cease until their significance could be determined by a trained archaeologist and appropriate actions taken. Similarly, if any TCPs are identified at the SERF construction sites, site activities would cease until appropriate mitigation measures could be determined by the appropriate parties (see Appendix B).

Four archaeological resource sites have been recorded within or immediately adjacent to the SWWS Plant project area or between the SWWS Plant area and the built-up area immediately to the west. Those sites are described in Section 3.5.1 and may already have been disturbed by previous construction in the area. However, before construction of the water storage tanks, the archaeological resource site boundaries would be precisely mapped and all records of previous activity at the sites would be consulted.

If any sites cannot be avoided by construction activity, a mitigation plan would be developed in consultation with the SHPO and other involved parties, potentially including Native American tribes. Expansion of the SERF and the TA-60 evaporation ponds may involve subsurface disturbance; any ground-disturbing maintenance or construction activities would take into consideration the potential uncovering of previously undiscovered cultural resources.

If any archaeological sites are identified during construction, those sites would be documented and evaluated for NRHP eligibility. Project impacts on unevaluated and/or potentially eligible cultural resources may be significant if NRHP eligibility status has not been determined. When documented and evaluated through consultation with the SHPO, adverse impacts on NRHP-eligible and NRHP-listed cultural resources would be avoided and, if avoidance is not possible, mitigation of adverse effects would be required.

4.1.2.5 Air Quality

Implementation of the Partial Reuse Alternative would have short-term, minor adverse impacts on air quality. Construction of the SERF expansion would generate particulate matter emissions as fugitive dust from ground-disturbing activities (such as site grading and construction). Appropriate fugitive dust-control measures would be employed during construction activities to suppress emissions. Emissions of all criteria pollutants would result from combustion of fuels from construction equipment, such as cranes, front-end loaders, and haul trucks.

Construction-related emissions would be greatest during initial site preparation activities and would vary from day to day depending on the construction phase, level of activity, and prevailing weather conditions. Fugitive dust and combustion emissions associated with construction equipment would produce slightly elevated air pollutant concentrations. However, the effects would be temporary, would fall off rapidly with distance from the proposed project sites, and would not result in any long-term impacts.

The application of BMPs to address air quality impacts by fugitive dust emissions is required by the CAA and New Mexico regulations. The employment of dust suppression BMPs as part of the construction projects would be expected to reduce or eliminate fugitive dust emissions from the disturbed sites.

4.1.2.6 Noise

Under the SERF Partial Reuse Alternative, a temporary, minor increase in noise produced during construction would occur. This noise would be caused by heavy equipment, cutting tools, and other light construction activities. Noise would be confined to the construction area. The increase in noise would occur only during weekdays from 7 a.m. to 5 p.m. for the lagoon pond; this would avoid nighttime impacts to the people living at the Royal Park Mobile Home Park. However, the increase in noise at the expanded SERF would occur during the night if required, because its potential to disturb non-LANL residents is minimal. The increased noise would have a short-term, minor effect on the nearest noise-sensitive receptors. Noise at the site would be audible primarily to the involved workers and to workers in the immediate vicinity of the SERF project site. Involved site workers would be required to wear appropriate PPE, including hearing protection.

4.1.2.7 Human Health

Under the Partial Reuse Alternative, expanded SERF construction activities may adversely affect workers if accidents were to occur. Potential adverse effects could range from relatively minor effects (such as cuts, bruises, or sprains) to major effects (such as broken bones, electric shock, severe lacerations, or fatalities). To reduce the risk of serious injuries, all workers would be required to adhere to a Health and Safety Plan, Integrated Work Document, and job-specific training plans, and all equipment would be subject to inspection requirements.

Operational activities at the expanded SERF would be the same as those under the No Action Alternative, with an anticipated staffing level of one full-time operator. The potential effects of the Partial Reuse Alternative are the same as those expected for the No Action Alternative.

4.1.2.8 Utilities and Infrastructure

Under the SERF Partial Reuse Alternative, a small increase in electrical use would be anticipated with the expansion of operations to increase the production of treated effluent from 100,000 gal./d to about 400,000 gal./d (379,000 to 1.514 million L/d). Implementation of the Partial Reuse Alternative would have a beneficial impact on potable water usage by replacing up to 324,000 gal./d (1.226 million L/d) of the SCC’s potable water demands with recycled effluent. The amount of effluent discharged from Outfall 001 is anticipated to decrease by up to 75 percent with increased reuse of the treated effluent. Using an adaptive resource management approach, some adjustment in the effluent discharged from Outfall 001 may be required to supplement stormwater and snowmelt to maintain soil moisture in reach S-2 in Sandia Canyon. The overall project would be expected to have a minor long-term beneficial impact on the overall LANL use of potable water.

4.1.2.9 Traffic and Transportation

Under the SERF Partial Reuse Alternative, a temporary increase in traffic would occur in the vicinity of the SERF, and a smaller increase would occur on local roads, during the construction phase of the project. Afterwards, traffic in the vicinity of the SERF would be anticipated to return to essentially that in the No Action Alternative due to the minimal staffing increases associated with this project and small amounts of waste generated for off-site disposal.

4.1.2.10 Environmental Restoration and Waste Management

Under the Partial Reuse Alternative, the treatment capacity of the SERF would be expanded to approximately 400,000 gal./d (1.514 million L/d). The expansion would involve the placement of two or three water storage tanks at the current location of SWMU 03-014(o), with a possible additional tank located at or adjacent to SWMUs 03-014(c) and 03-014(g). The SWMUs would be investigated and determined to be administratively complete before construction of the tank(s) at those locations. This could represent an accelerated schedule for completing investigation activities at the SWMUs. The SWMUs are currently under investigation, with results reported in the Upper Sandia Canyon Aggregate Area investigation report (LANL 2010c).

A principal waste stream generated by SERF is filter cake, which is solid material consisting principally of magnesium silicates and iron oxy-hydroxides, along with other minor chemically co-precipitated constituents associated with the filtration process. Waste filter cake generated by the SERF would increase from approximately 360 lb/d (163 kg/d) to approximately 1,000 lb/d (454 kg/d), based on a moisture content of approximately 50 percent. The filter cake waste is expected to be classified as New Mexico Special Waste, based on previous waste characterization results (LANL 2005). RO reject water would increase from 2 gal./min to 8 gal./min (0.1 L/sec to 0.5 L/sec) and would be discharged to the expanded evaporation ponds at TA-60.

Small amounts of construction and demolition debris would potentially be generated during construction of the SERF expansion. The debris would represent a one-time waste stream that would be subject to recycling, if applicable, or processing as municipal or industrial solid waste through the Los Alamos County waste transfer station. Employment of appropriate construction equipment fueling practices and waste management practices for handling and disposing of construction-generated waste materials would be expected to reduce or eliminate any site contamination by equipment fluids and wastes.

The potential direct effects on environmental restoration and waste management of the Partial Reuse Alternative would include acceleration of the investigation of SWMUs 03-014(o), 03-014(c), and 03-014(g), a small volume of municipal or industrial solid waste generated by construction and demolition activities on a one-time basis, and an increase in shipments of New Mexico Special Waste (SERF filter cake) from one to three 20-yd^3 (15.3-m^3) roll-off bins per month to an off-site, licensed disposal facility.

In addition, the reduced volume of water discharged to Sandia Canyon would potentially diminish the extent of saturated soil in reach S-2 with a corresponding reduction in wetland vegetation. This could result in the mobilization of contaminated sediment—particularly chromium and PCBs – unless successive upland vegetation coverage adequately served to retard erosion and silt movement downstream.

4.1.3 Total Reuse Alternative

4.1.3.1 Geology and Soils

Under the Total Reuse Alternative, impacts on geology and soils due to the SERF expansion would be the same as in the Partial Reuse Alternative. No additional construction would be planned.

4.1.3.2 Water Resources

Under the Total Reuse Alternative, up to 100 percent of the SERF effluent would be recycled for use at the SCC, the LDCC, and the TA-3 Power Plant. The discharge into Sandia Canyon via Outfall 001 would be reduced to zero, except during periods when cooling towers or boilers are shut down for maintenance. NPDES permit limitations for PCBs would be met during these occasional discharges. Therefore, the only source of water flowing into Sandia Canyon under most circumstances would be stormwater runoff and snowmelt. BMPs to reduce or prevent the movement of silt or sediment would be implemented at construction sites. The Total Reuse Alternative would enable the SERF to meet 100 percent of the demand for potable water by the SCC, the LDCC, and the TA-3 Power Plant, thus reducing LANL's potable water use by up to approximately 406,000 gal./d (1.537 million L/d).

It is unlikely that groundwater conditions in the regional aquifer would be adversely affected by the elimination of discharges from Outfall 001. The regional aquifer occurs at approximately 1,200 ft (365 m) below the mesa top near upper Sandia Canyon. No perched-intermediate groundwater has been identified beneath this area.

With zero discharge from the expanded SERF, surface and alluvial groundwater conditions would likely be maintained only by stormwater runoff and snowmelt. Alluvial groundwater levels within the lower portion of reach S-2 would potentially decrease as a result of indirect impacts from the Total Reuse Alternative. Surface soil saturation conditions would likely not be maintained within the lower portion of reach S-2.

4.1.3.3 Ecological Resources

Under the Total Reuse Alternative, impacts on ecological resources due to construction of the expanded SERF would be similar to those in the Partial Reuse Alternative; however, operation of the SERF would increase adverse impacts on the wetland area in the lower portion of reach S-2. With zero liquid discharge from the expanded SERF, wetland conditions would likely be maintained only by stormwater runoff and snowmelt, which would likely substantially reduce the size of the 3-acre (1.2-hectare) wetland or eliminate it. Reductions in effluent in conjunction with possible advancing erosion into the alluvial soil would likely change the vegetative community to one dominated by species adapted to drier soil conditions, thus likely resulting in a corresponding shift in wildlife that frequent the wetlands. No direct fill activities are associated with the Total Reuse Alternative. The loss of wetland acreage would be mitigated through the implementation of wetland restoration or enhancement, or through the participation in a mitigation bank or in-lieu of fee mitigation agreements, as appropriate, under the provisions of the Mitigation Action Plan. If the 3-acre (1.2-hectare) Sandia Canyon wetland were altered (either reduced or eliminated) by the Total Reuse Alternative actions, NNSA would be required to implement USACE compensatory mitigation. Wetland acreage would most likely be replaced at another location either through augmentation of an existing wetland area or other approved means. Several existing wetland areas next to the Rio Grande could be possible sites for wetland enhancement. The use of other mitigation measures to mitigate potentially adverse impacts to threatened or endangered species, game animals, and other small mammals and birds as discussed for the Partial Reuse Alternative would also apply to the Total Reuse Alternative (see Appendix B).

4.1.3.4 Cultural Resources

The Total Reuse Alternative would have the same impacts on cultural resources as the Partial Reuse Alternative. Expansion of the SERF facility and expansion of the TA-60 evaporation ponds would require the same mitigating actions to protect the four cultural resource sites in the vicinity. As a result, the effects of the Total Reuse Alternative are the same as those of the Partial Reuse Alternative.

4.1.3.5 Air Quality

Impacts on air quality in the Los Alamos area would be similar to those expected under the Partial Reuse Alternative. Minor amounts of airborne dust could be generated locally and for short periods of time during construction of the SERF expansion and addition of storage tanks. The dust could be controlled by appropriate construction practices for dust suppression.

4.1.3.6 Noise

Under the SERF Total Reuse Alternative, a temporary increase in the noise level at the SERF would be the same as that identified for the Partial Reuse Alternative. Noise at the site would be audible primarily to the involved workers and to workers in the immediate vicinity of the SERF project site. Involved site workers would be required to wear appropriate PPE, including hearing protection.

4.1.3.7 Human Health

Under the Total Reuse Alternative, construction activities would be the same as those for the Partial Reuse Alternative. The corresponding potential adverse effects to human health are the same as those expected for the Partial Reuse Alternative.

Operational activities at the expanded SERF would be the same as those under the No Action Alternative, with an anticipated staffing level of one full-time operator. The potential effects of the Total Reuse Alternative are the same as those expected for the No Action Alternative and the Partial Reuse Alternative.

4.1.3.8 Utilities and Infrastructure

Under the SERF Total Reuse Alternative, a small increase in electrical use would be anticipated with the expansion of operations to pump treated effluent to the LDCC and the TA-3 Power Plant. The potable water demands met by the expanded SERF would be up to 406,000 gal./d (1.537 million L/d), which would have a minor beneficial impact on water utilities.

4.1.3.9 Traffic and Transportation

Under the SERF Total Reuse Alternative, a temporary increase in traffic would occur in the vicinity of the SERF, and to a lesser extent on local roads. Afterwards, traffic and transportation in the vicinity of the SERF would be anticipated to return to essentially that in the No Action Alternative, due to the minimal staffing increases associated with this project.

4.1.3.10 Environmental Restoration and Waste Management

Under the Total Reuse Alternative, the SERF physical expansion would be the same as in the Partial Reuse Alternative. The potential direct environmental restoration and waste management effects of the Total Reuse Alternative would be the same as those expected for the Partial Reuse Alternative, except that little or no water would be discharged to reach S-2. The elimination of treated effluent discharged to Outfall 001 would likely result in indirect impacts on the lower half of reach S-2; it would indirectly cause saturated soils in the area to revert to dryer soil conditions, with a resultant loss of wetland vegetation. The mobilization of contaminants—particularly chromium and PCBs—in the sediments within reach S-2 could be affected, and any currently projected actions under the Consent Order may need to be modified to address changes in contaminant transport.

4.2 ENVIRONMENTAL RESTORATION ALTERNATIVES FOR REACH S-2

4.2.1 No Action

4.2.1.1 Geology and Soils

Under the No Action Alternative, reach S-2 would be maintained at or near current conditions. No excavation activities or associated disturbance would be required to continue monitoring of surface and alluvial groundwater conditions. Erosion of the channel is occurring now and would likely continue at the lower end of reach S-2, leading to a slightly more deeply-incised channel for part of the reach. Over time, this could result in a slight lowering of the local water table, and increased channelization could result in less infiltration of water into sediments of the floodplain and inactive channel deposits. The result would likely be somewhat dryer soils and sediments in some areas of reach S-2, with a corresponding change to more oxidizing conditions and a slight reduction or loss of wetland conditions.

4.2.1.2 Water Resources

Under the No Action Alternative, headward erosion of the main drainage channel in reach S-2 would likely continue, resulting in increasingly slightly deeper and narrower channel. The increased channelization of reach S-2 could result in slightly accelerated surface water flow downstream instead of passing more slowly in multiple channels through thick wetland vegetation within reach S-2. Over the long-term, this could also result in increased erosion and transport of contaminated sediments that are currently essentially stable within the lower portion of reach S-2. Increased flow beyond reach S-2 could also result in an increased availability of surface and shallow alluvial water for riparian vegetation and animal species. The downstream effects of increased surface flow beyond reach S-2 would require ongoing monitoring to quantify.

4.2.1.3 Ecological Resources

Under the No Action Alternative, the anticipated deeper and narrower channel described above could result in slightly greater transport of contaminated sediments downstream and their continued availability for wildlife uptake via surface water. Under the No Action Alternative for environmental restoration, long-term wetland reduction or elimination could occur through erosional actions, and corresponding changes to vegetation type could also occur. No changes in suitable habitat for listed species and no changes in floodplain conditions would be anticipated as a result of the No Action Alternative.

4.2.1.4 Cultural Resources

Under the No Action Alternative, no construction activities would occur in the vicinity of reach S-2 and cultural resource sites would not be affected.

4.2.1.5 Air Quality

No change to the air quality in the Los Alamos area would be expected under the No Action Alternative because no excavation or construction activities would be required.

4.2.1.6 Noise

Under the No Action Alternative, noise levels in reach S-2 would be maintained at or near current conditions. Ambient sound levels range from about 33 to 58 dBA within the Sandia Canyon area of reach S-2.

4.2.1.7 Human Health

No direct effects on human health are expected under the No Action Alternative. No activities, beyond periodic monitoring requirements, would be necessary. Exposure of workers to contaminants in reach S-2 would be minimal and of very short duration. Indirect human health effects could result if increased channelization resulted in accelerated movement of contaminants to the regional aquifer, as described in Section 4.2.1.2. Those effects would be minimal because the regional aquifer is closely monitored and treatment options are generally available to protect the public from groundwater contamination.

4.2.1.8 Utilities and Infrastructure

Under the No Action Alternative, utilities and infrastructure in reach S-2 would remain the same. No impacts on the amount or type of utilities and infrastructure would be expected from the No Action Alternative.

4.2.1.9 Traffic and Transportation

Under the No Action Alternative, no change is anticipated in traffic and transportation in the vicinity of reach S-2. No impacts on the amount or type of traffic and transportation needs would be expected from the No Action Alternative.

4.2.1.10 Environmental Restoration and Waste Management

The No Action Alternative for reach S-2 could result in changes to soil moisture conditions in reach S-2 through alteration of the main drainage channel (see Section 4.2.1.1). A change from saturated, reducing conditions to dryer, oxidizing conditions, along with increased surface water flow in the main channel, could allow contaminants to become slightly more mobile and be transported beyond reach S-2. Mobilization of the contaminants currently retained in reach S-2 could necessitate remedial actions to protect downstream areas, including recharge to the regional aquifer and intermediate-perched groundwater zones. Such remedial actions would be subject to Consent Order requirements as determined by NMED.

Remedial actions to address mobilization of contaminants in reach S-2 or other areas downstream would likely result in the generation of substantial volumes of waste in one or more classifications, including but not limited to RCRA hazardous waste, New Mexico Special Waste, PCB waste, and industrial waste. The waste would be containerized and shipped to an appropriate licensed off-site TSDF.

4.2.2 Stabilization in Place with Long-Term Monitoring

4.2.2.1 Geology and Soils

Under the Stabilization in Place with Long-term Monitoring Alternative (hereafter referred to as the Stabilization in Place Alternative), a grade control structure would be constructed at the lower end of reach S-2. This would likely involve excavation of sediment and tuff bedrock to enable placement of rock-filled gabions across the canyon floor. The intended effect of this action would be to reduce or halt headward-cutting erosion of the active channel, slowing the flow of surface water, and promoting the deposition of sediment upstream of the grade control structure and stability of the contaminated sediment.

The potential effects of installation of a grade control structure could include increased retention of sediment in reach S-2 and possible continued saturated soil conditions, particularly in the area immediately upstream of the structure. To enable installation of the grade control structure, an access road would be built to move heavy equipment and material into Sandia Canyon. Less than 2 acres (0.8 hectares) would be disturbed by construction of the grade control structure and access road. Potential soil erosion during construction of the road would be mitigated by the application of BMPs.

4.2.2.2 Water Resources

The Stabilization in Place Alternative would establish a more controlled surface water flow. By preventing channel erosion to greater depths, the grade control structure could maintain shallow groundwater depth at or near current levels. The grade control structure would also likely reduce the potential for erosion of contaminated sediments from reach S-2 and their transport downstream.

It is likely that intermediate or regional groundwater conditions would be affected by a reduction of surface water flow beyond reach S-2 in the form of reduced recharge to the perched-intermediate and regional aquifer groundwater zones to the east of reach S-2. Stabilization of contaminants in reach S-2 would protect the regional aquifer by reducing the contaminant concentrations in surface water, thus protecting the deeper groundwater zones from potential migration of soluble constituents.

BMPs (such as the use of silt fencing, straw bales or other devices) would also be used to prevent or reduce surface water flow velocity during the construction of the grade control structure and access road. Sandia Canyon is listed as impaired, and it is anticipated that the TMDL process will guide corrective actions for surface water quality. Discharge of dredged or fill materials in the surface flow would require a CWA Section 404 permit. Additionally, any actions taken to moderate ground water flow in order to maximize the soil moisture content from stormwater and snow melt sources would also be mitigated by the use of BMPs.

4.2.2.3 Ecological Resources

The Stabilization in Place Alternative would establish a more controlled surface water flow, with water possibly retained upstream of the grade control structure and erosion reduced downstream of the structure. A grade control structure would allow optimal utilization of stormwater runoff and snowmelt within the current wetland area; about 25 percent of the surface water passing into reach S-2 is estimated to come from these sources rather than from LANL operational effluents.

In the event that the 3-acre (1.2-hectare) wetland area is reduced or eliminated by actions required to install a grade control structure, it would represent less than 10 percent of the total wetland areas identified in the 2005 delineation of LANL wetland acreage. The Stabilization in Place Alternative would result in fill (direct impact) within the current wetland area through siltation and decrease in erosion, but it could also provide an opportunity to maintain some portion of the wetland area within the canyon.

The loss of wetland acreage would be mitigated through the implementation of wetland restoration or enhancement, or through the participation in a mitigation bank or in-lieu of fee mitigation agreements, as appropriate, under the provisions of the Mitigation Action Plan. If the 3-acre (1.2-hectare) Sandia Canyon wetland was altered (either reduced or eliminated) by the Stabilization in Place Alternative, NNSA would be required to implement USACE compensatory mitigation. Wetland acreage would most likely be replaced at another location either through augmentation of an existing wetland area or other approved means. Several existing wetland areas next to the Rio Grande could be possible sites for wetland enhancement (see Appendix B).

To the extent that the wetland area is reduced or eliminated, changes in the vegetation and wildlife community typically found in canyon wetlands could occur. The use of other mitigation measures to alleviate potentially adverse impacts to threatened or endangered species, game animals and other small mammals and birds, as discussed for the SERF Partial Reuse and Total Reuse Alternatives, would also apply to the Stabilization in Place Alternative for environmental restoration actions. In addition, to enable installation of the grade control structure, an access road would be built to move heavy equipment and material into Sandia Canyon. Construction of the road could result in temporary and permanent effects to vegetation and wildlife habitat. No changes in suitable habitat for listed species and no changes in floodplain conditions would be anticipated as a result of the Stabilization in Place Alternative.

Mitigation measures for game animals and other small mammals and birds would include BMPs such as re-seeding disturbed areas with a native seed mix and then monitoring the sites and re-seeding them as necessary to achieve at least 50 percent vegetation coverage (see Appendix B). This mitigation measure would result in the recovery of wildlife habitat that would otherwise be lost to use by various animals and birds.

Construction associated with the grade control structure would be conducted in a manner to avoid adverse impacts on migratory birds to the extent practicable. No measurable long-term adverse impacts on migratory birds are anticipated. However, short-term, negligible to minor adverse effects on migratory birds could be expected from visual and noise disturbances during construction activities. These impacts, most likely in the form of escape or avoidance behaviors, are anticipated to be temporary.

4.2.2.4 Cultural Resources

This alternative would involve the installation of a grade control structure at the downstream end of reach S-2 to stabilize the stream channel and prevent stream flow from incising a deeper channel, mobilizing contaminated sediments, and dropping the water table. Under this alternative, the four cultural resources sites near the project area would not be directly affected by construction. However, to ensure that they are not disturbed by vehicle traffic and other activities, the resources would be precisely mapped and flagged to alert construction personnel of the site locations. In accordance with the provisions of the Mitigation Action Plan, other provisions of the LANL CRMP would also be followed. In the event that any buried archaeological resource, remains, or items of cultural significance were encountered during construction, site activities would cease until their significance could be determined by a trained archaeologist and appropriate actions taken. Similarly, if any TCPs are identified at the SERF construction sites, site activities would cease until appropriate mitigation measures could be determined by the appropriate parties (see Appendix B).

4.2.2.5 Air Quality

No change in air quality in the Los Alamos area would be expected under the Stabilization in Place Alternative. Minor amounts of airborne dust could be generated locally and for short periods of time during construction of an access road and the grade control structure. The dust could be controlled by appropriate construction practices for dust suppression.

4.2.2.6 Noise

Under the Stabilization in Place Alternative, a temporary increase in the daytime noise level in reach S-2 would occur during construction activities. Noise at the site would be audible primarily to the involved workers and to workers in the immediate vicinity of the project site during the construction of the grade control structure and related activities. Involved site workers would be required to wear appropriate PPE, including hearing protection. Residents of nearby Royal Crest Mobile Home Park would hear some the activities, but sounds should attenuate to less than the 55 dBA at night after work ends for the day in reach S-2.

4.2.2.7 Human Health

Under the Stabilization in Place Alternative, construction activities would be required to install a grade control structure and access road in reach S-2. Construction activities could include the use of heavy equipment for excavating, grading, and hoisting material into place. Potential adverse effects on worker health due to injuries could range from relatively minor effects (such as cuts, bruises, or sprains) to major effects (such as broken bones, severe lacerations, or fatalities). To reduce the risk of serious injuries or exposures, all workers would be required to adhere to a Health and Safety Plan, Integrated Work Document, and job-specific training plans, and all equipment would be subject to inspection requirements. Excavation of contaminated sediment could potentially expose workers to relatively low levels of various chemicals. Exposure would be minimized by required worker training and use of appropriate PPE.

Depending on the timing of construction, the canyon could be subject to sudden flash flooding following intense thunderstorms. Flash flood conditions would likely require temporary evacuation of the canyon area, but no effect on human health is likely.

4.2.2.8 Utilities and Infrastructure

Under the Stabilization In Place Alternative, a grade control structure would be constructed in reach S-2, as shown in Figure 2-5. An access road would be constructed to allow construction of the grade control structure. The access road would be a one-lane road beginning at the south rim of Sandia Canyon in TA-3 and ending about 1825 ft (556 m) down into the canyon bottom near the proposed grade control structure at the eastern end of the wetland in reach S-2. The route would utilize an abandoned pipeline service roadbed that once existed in the upper part of reach S-2 to the extent practicable to reduce area disturbance. The access road would be approximately 10 to 12 ft (3 to 3.6 m) wide. A short access road may be constructed for canyon investigation requirements in reach S-2 that would allow access to the canyon bottom, although it may not extend as far downcanyon as the proposed grade control structure. Any possible use of existing roads would be made, but these would likely need to be enhanced to accommodate heavy equipment and materials.

The grade control structure would be constructed at the eastern end of the wetland. It would be about 30 to 50 ft (9.1 to 15.2 m) in length and anchored four to six feet (1.2 to 1.8 m) in bedrock at each end (Figure 2-5). The structure's height would be approximately 6 feet (2 m) above grade. Disturbed areas would be restored, to the extent practicable, at the completion of construction activities. Any utility lines present in reach S-2 would be identified before starting work on the proposed project and avoidance measures would be taken during construction as well as after construction when disturbed areas would be restored. As a result, impacts on utilities and infrastructure in reach S-2 would be minimal.

4.2.2.9 Traffic and Transportation

Under the Stabilization in Place Alternative, a temporary increase in traffic would occur in the vicinity of reach S-2, and a smaller increase would occur on local roads, as construction materials were delivered to the site. Afterwards, traffic and transportation in the vicinity of reach S-2 would return to that in the No Action Alternative.

4.2.2.10 Environmental Restoration and Waste Management

The Stabilization in Place Alternative would likely involve the excavation of some quantity of potentially contaminated soil or sediment in reach S-2. The excavated material would be characterized for waste management purposes, placed in appropriate containers, and transported to an approved facility for treatment or disposal. The volume of waste would depend on the final design and size of the proposed grade control structure and the configuration of the canyon at the selected location. This would not represent an ongoing waste stream, but a one-time event during construction.

Sandia Canyon as a whole is designated as AOC C-00-007, and is the subject of ongoing investigation in accordance with the Consent Order. Reach S-2 has been investigated, with results reported in the 2009 Sandia Canyon Investigation Report (LANL 2009c). That report found that Reach S-2 contains approximately 80 to 90 percent of the inventory of chromium and PCBs within Sandia Canyon sediment deposits. Stabilization in Place would be used to maintain the contaminant inventory of reach S-2 at or near its current condition. Therefore, the impact on AOC C-00-027 is expected to be minimal, and long-term monitoring is likely to be consistent with the ongoing investigation or other actions taken as directed by NMED or the Consent Order.

4.2.3 Removal with Off-site Disposal

4.2.3.1 Geology and Soils

The Removal with Off-site Disposal Alternative would disturb less than 5 acres (2 hectares) of land, and would involve excavating up to 100,000 yd^3 (76,570 m^3) of contaminated sediment in reach S-2, and possibly bedrock where contaminants are above specified action levels. The removed sediment and tuff would be replaced with clean fill. Due to the complexity of sediment deposits in reach S-2, it is unlikely that the distribution of fine and coarse material could be replicated or even approximated with clean fill. Excavation activities would require construction of an access road for the movement of heavy equipment and material into and out of the canyon, similar to that described for the Stabilization in Place Alternative. The location of the access road for soil removal would likely be different, but would use previously constructed roadbeds to the extent practicable. The presence of a road and the movement of large numbers of trucks and other heavy equipment could result in accelerated erosion on or near the road. However, BMPs would be employed to prevent erosion as directed by the required SWPPP.

4.2.3.2 Water Resources

The Removal with Off-site Disposal Alternative would eliminate or greatly reduce contaminants that could be transported by surface water. Replacement of contaminated sediment with clean fill could also affect the water-holding capacity of reach S-2 by altering the distribution of coarse and fine material currently present. A predominance of coarser clean fill could result in a reduced transit time for water in reach S-2, but the specific effects would need to be observed through ongoing monitoring of surface water flow. The installation of berms or other surface flow stabilizing structures may be required in the long term. Sandia Canyon is listed as impaired, and it is anticipated that the TMDL process will guide corrective actions for surface-water quality. Discharge of dredged or fill materials in the surface flow would require a CWA Section 404 permit.

It is unlikely that regional aquifer groundwater conditions would be adversely affected by removing contaminated sediment in reach S-2. The regional aquifer is separated from the alluvial groundwater in the canyon bottom at reach S-2 by approximately 1,100 ft (335 m) of unsaturated bedrock. No perched-intermediate groundwater has been identified beneath reach S-2. Removal of contaminant source material would improve the quality of surface water and, to the extent that the surface water recharges deeper groundwater zones, could beneficially affect the quality of alluvial, intermediate, and regional groundwater.

4.2.3.3 Ecological Resources

The Removal with Off-site Disposal Alternative would eliminate or greatly reduce the contaminants in the wetland area and could eliminate or greatly reduce the wetland area by excavation as well. Replacement of contaminated sediment with clean fill could also affect the water-holding capacity of reach S-2 by altering the distribution of coarse and fine material currently present; however, the specific long-term effects would need to be observed through ongoing monitoring of surface water flow.

To the extent that the wetland area is eliminated, changes in the vegetation and wildlife community typically found in canyon wetlands would occur. In addition, excavation activities would require construction of an access road for the movement of heavy equipment and material into and out of the canyon. The presence of a road and the movement of large numbers of trucks and other heavy equipment could result in temporary and permanent effects to vegetation and wildlife habitat.

The loss of wetland acreage would be mitigated through the implementation of wetland restoration or enhancement, or through the participation in a mitigation bank or in-lieu of fee mitigation agreements, as appropriate, under the provisions of the Mitigation Action Plan. Additionally, adherence to SWPPPs would minimize surface water degradation within reach S-2 while environmental restoration actions were being conducted. Appropriate BMPs would be implemented during construction activities. In the event of a spill or leak of fuel, hydraulic fluid, or other construction-related hazardous material, all spills would be contained and cleaned up quickly in accordance with an approved spill prevention, control, and countermeasure plan.

Implementation of the Removal and Offsite Disposal Alternative would be expected to result in short-term clearing of vegetation at various construction areas. Although the changes to habitat condition would be long-term or permanent, these could be moderated by the implementation of mitigation measures that would serve to reseed disturbed areas with native species and insure at least 50 percent vegetative coverage, as described in the Mitigation Action Plan.

Implementing the Total Removal with Off-site Disposal Alternative may affect but would not likely adversely affect threatened or endangered habitat in Sandia Canyon. Mitigation actions identified in the Mitigation Action Plan for threatened or endangered species include the implementation of all reasonable and prudent measures identified during the consultation process with the USFWS, which would be completed prior to beginning any construction activities. The mitigation actions also would include following the LANL Threatened and Endangered Species Habitat Management Plan provisions on noise generation and erosion and runoff controls.

Change to floodplain conditions would also be long-term or permanent, and may require the installation of berms or other surface flow stabilizers. These features would be installed as part of the overall project and would involve contouring the fill material placed in the areas where sediment was removed.

4.2.3.4 Cultural Resources

Under this alternative, up to 100,000 yd^3 (76,570 m^3) of contaminated sediment in reach S-2 would be mechanically excavated and hauled off-site. Before construction, the site boundaries of the three archaeological sites in the vicinity would be mapped and flagged to determine their precise relationship to the area of disturbance. These sites are located about 100 to 300 ft (30 to 91 m) south of reach S-2 and would be precisely located to avoid disturbance during construction of the access road. If these distances are confirmed by pre-construction site visits and mapping, monitoring the site boundaries during construction would be sufficient to protect the sites from inadvertent damage.

However, the site closest to reach S-2—an NRHP-eligible Late Coalition- to Early Classic-period structure—is the only site likely to preserve intact subsurface cultural materials. This site could potentially be impacted by changes to drainage patterns, changes in nearby slope, and other landscape modifications that could lead to erosion of cultural deposits. If such disturbance appears possible, LANL cultural resources managers, project engineers, and the New Mexico SHPO would be consulted to develop a site stabilization plan. If undocumented sites are discovered during removal of sediments and soil, archaeological data recovery and/or mitigation may be necessary to capture information on the sites before their destruction. The need for such activity would be determined in consultations between LANL cultural resources managers and the New Mexico SHPO. In accordance with the provisions of the Mitigation Action Plan, other provisions of the LANL CRMP would also be followed. In the event that any buried archaeological resource, remains, or items of cultural significance were encountered during construction, site activities would cease until their significance could be determined by a trained archaeologist and appropriate actions taken. Similarly, if any TCPs are identified at the SERF construction sites, site activities would cease until appropriate mitigation measures could be determined by the appropriate parties (see Appendix B).

4.2.3.5 Air Quality

No change to the air quality in the Los Alamos airshed would be expected to result from implementing the Removal with Off-site Disposal Alternative. The construction project would generate particulate matter emissions as fugitive dust from ground-disturbing activities (such as access road construction, sediment excavation, and heavy equipment traffic). Fugitive dust emissions would vary from day to day depending on the construction phase, level of activity, and prevailing weather conditions. Appropriate fugitive dust control measures, such as application of water or soil tackifiers, would be employed during construction activities to suppress dust emissions. Emissions of all criteria pollutants would result from the combustion of fuels from excavation equipment and on-road haul trucks removing sediment as well as construction commuter emissions. All emissions would be temporary in nature and would not impact the air quality in the region.

4.2.3.6 Noise

Under the Removal with Off-site Disposal Alternative, a temporary increase in the daytime (7 a.m. to 9 p.m.) noise level in reach S-2 would occur. Heavy equipment, such as front-end loaders and backhoes, would produce intermittent noise levels at around 72 to 93 dBA at 50 ft (15 m) from the work site under normal working conditions (see Table 3-4). Truck traffic would occur frequently, but would generally produce noise levels below that of the heavy equipment. Worker PPE would be required if site-specific work produced noise levels above the action level at LANL of 82 dBA.

Physical features, such as the Sandia Canyon topography and vegetation, would help to attenuate noise levels to nearly background levels during the day before reaching publicly accessible areas, and should not be particularly noticeable to most members of the public and residents at Royal Crest Mobile Home Park. Noise at the site would be audible primarily to the involved workers and to workers in the immediate vicinity of the project site during removal activities. Involved site workers would be required to wear appropriate PPE, including hearing protection. Night time noise levels would return to ambient site levels after work in reach S-2 ended for the day.

4.2.3.7 Human Health

Under the Removal with Off-site Disposal Alternative, heavy equipment would be required to excavate, containerize, and transport contaminated sediment in reach S-2. Potential adverse effects could range from relatively minor effects (such as cuts, bruises, or sprains) to major effects (such as broken bones, severe lacerations, or fatalities).

Excavation of contaminated sediment could potentially expose workers to relatively low levels of various chemicals, including metals such as chromium, PCBs, and polycyclic aromatic hydrocarbons (PAHs). The concentrations of these and other chemicals in sediments of reach S-2 have been estimated to pose no potential unacceptable risk to human health (LANL 2009c) under a recreational use scenario. An evaluation of a residential use scenario (provided for comparison purposes only; residential use is not expected) indicated that risk from PCBs and PAHs could exceed target levels. Excavation would expose workers to heavy metals, such as chromium. Under a construction worker scenario similar to that expected for the Removal with Off-site Disposal Alternative, worker exposure would be minimized by required worker training and use of appropriate PPE. Risk to human health would likely be below target levels.

Before removing contaminated soil, a human health risk screening assessment would be conducted by analyzing samples collected from the contaminated soil. Human health risk screening assessments for chemicals of potential concern (COPCs) would be conducted using construction worker soil screening levels (SSLs) obtained from NMED guidance (NMED 2009) or from the EPA regional screening level table, available online at the following address: http://www.epa.gov/earth1r6/6pd/rcra_c/pd-n/screen.htm

Depending on the timing of the removal activities, the canyon could be subject to sudden flash flooding following intense thunderstorms. To reduce the risk of serious injuries or exposures, all workers would be required to adhere to a Health and Safety Plan, Integrated Work Document, and job-specific training plans, and all equipment would be subject to inspection requirements. Flash flood conditions would likely require temporary evacuation of the canyon area; no effect on human health is likely.

4.2.3.8 Utilities and Infrastructure

Under the Removal with Off-site Disposal Alternative, removal of up to 100,000 yd^3 (76,570 m^3) of sediment and soils with contamination above specified action levels in reach S-2 would require the use of heavy equipment such as backhoes, front end loaders, dump trucks, and other similar construction equipment. If this action alternative were selected, an access road would be established to allow the removal of sediment and soils with contamination above specified action in reach S-2. It would be constructed as described in Section 4.2.2.8. Disturbed areas would be restored, to the extent practicable, at the completion of construction activities.

A natural gas pipeline location in the upper part of reach S-2 would need to be identified before removal activities begin. Avoidance measures would be taken during excavation and removal of sediments as well as during restoration of disturbed areas afterwards. As a result, impacts on utilities and infrastructure in reach S-2 would be minimal.

4.2.3.9 Traffic and Transportation

Under the Removal with Off-site Disposal Alternative, up to 100,000 yd^3 (76,570 m^3) of sediments and soil above specified action levels would be excavated and removed from reach S-2. The Investigation Report for Sandia Canyon indicates that no radioactive sediments are present in reach S-2 (LANL 2009c). The excavated sediments and soils would be containerized, characterized for waste management purposes, and then transported by truck to an appropriate licensed off-site disposal facility. It is likely that excavation would start at the eastern end of the wetland near the base of the access road.

For the purposes of this analysis, the anticipated disposal facility would be Energy Solutions of Utah or a similar licensed TSDF. Soils characterized as New Mexico Special Waste could be shipped to a TSDF in Rio Rancho, NM. It is estimated that between 5,000 to 10,000 shipments by truck may be required, with 10 to 20 yd^3 (8 to 15 m^3) of sediments and soil removed in each truckload. An equal number of truckloads would be required to import clean fill to the excavated area.

The haul route for trucks leaving LANL from the south rim of Sandia Canyon in TA-3 would be (1) Eniwetok Road to the intersection with Diamond Drive, (2) north on Diamond Drive through the access control station onto East Jemez Road, and (3) down East Jemez Road (known locally as the Truck Route) to NM 4. It is estimated that 25 to 50 trucks per day would transport material off-site. The upper limit of 50 outbound truckloads per day and an equal number of returning empty trucks is approximately 1.0 percent of the average daily traffic flow of 9,502 trips at the intersection of East Jemez Road at NM 4 (DOE 2008). Excavation and disposal may be feasible under an aggressive, uninterrupted, six- to eight-month schedule, with an equivalent time required to restore excavated areas with clean fill and reclaim them with native grasses or plant shrubs. It is estimated that up to 16 months may be required to accomplish removal, disposal, and restoration activities, with additional time required for any delays due to weather and other factors. Work would be performed during daylight hours.

4.2.3.10 Environmental Restoration and Waste Management

The Removal with Off-site Disposal Alternative would result in the generation of large volumes—up to 100,000 yd^3 (76,570 m^3)—of solid waste. The waste could be placed in various categories, depending on the contaminant types and concentrations. Possible waste classifications include but are not limited to RCRA hazardous waste, New Mexico Special Waste, PCB waste, and industrial waste. The waste would be containerized and shipped to an appropriate licensed off-site TSDF.

Reach S-2 contains approximately 80 to 90 percent of the inventory of chromium and PCBs within Sandia Canyon sediment deposits (LANL 2009c). The Removal with Off-site Disposal Alternative would eliminate a major source of contamination that potentially affects soil and sediment in Sandia Canyon reaches farther downstream, surface and shallow alluvial groundwater, intermediate groundwater, and the regional aquifer.

4.3 Summary of Environmental Consequences for the SERF and ER Alternatives

Table 4-1 presents a summary of the environmental consequences for each of the three SERF and three ER alternatives discussed in detail in previous sections. For the most part, environmental effects would be minor in nature. The exception is the effect to traffic and transportation resulting from implementation of the Removal with Off-site Disposal Alternative.

The proposed SERF project and the potential environmental restoration action measures, (described in Sections 4.1 and 4.2) are two separate actions and each will have different decision makers. NNSA will make a decision among the alternatives analyzed for the SERF project, NMED will make the decision(s) for environmental restoration of reach S-2 under the provisions of the 2005 Order on Consent, and DOE will then make associated implementing decisions for the environmental restoration actions selected by NMED. The different decision makers may select from a total of nine different possible combinations of action alternatives, as shown in Table 2-1. NMED has considerable decision making flexibility, so its decision may consist of components from more than one of the ER alternatives analyzed, provided it is within the boundaries of the NEPA analysis conducted in this EA.

The selection of any of the No Action Alternatives combined with the selection of any of the Action Alternatives would result in the environmental consequences described in Chapter 4 for the action alternatives. The selection of both No Action Alternatives would result in the environmental consequences of both No Action Alternatives in combination. However, as stated earlier in this EA, the selection of the No Action Alternative for the SERF project would not meet NNSA’s stated purpose and need for taking action with regard to addressing water quality standards for effluents and waste water reuse goals that would offset the use of potable water for non-human consumption purposes at LANL.

The selection of any of the four action alternative combinations would result in the SERF expansion action alternative environmental consequences for construction and operation of the SERF on the mesa top, added to the environmental restoration action alternative environmental consequences within Sandia Canyon. Implementing mitigation actions would be expected to render insignificant any potentially adverse significant impacts that might otherwise result from implementing the action alternatives. Appendix B contains the Mitigation Action Plan and identifies DOE and NNSA commitment to implementing these actions and the public annual reporting requirements.

Table 4-1. Summary of Environmental Consequences for SERF and ER Alternatives

Resource Area	SERF Alternatives			ER Alternatives for Reach S-2		
	No Action	Partial Reuse	Total Reuse	No Action	Stabilization with Long-term Monitoring	Removal with Off-site Disposal
Geology and Soils	No impact	5 acres disturbed. As a mitigation measure, BMPs would be implemented to control soil erosion.	5 acres disturbed. As a mitigation measure, BMPs would be implemented to control soil erosion.	No impact	Less than 2 acres disturbed. An access road would need to be constructed. As a mitigation measure, BMPs would be implemented to control soil erosion.	Less than 5 acres disturbed. Up to 100,000 yd^3 of contaminated sediments removed. An access road would need to be constructed. As a mitigation measure, BMPs would be implemented to control soil erosion.
Water Resources	NPDES permit effluent limitations for PCBs would not be met at Outfall 001.	NPDES permit limitations for PCBs would be met. As a mitigation measure, BMPs would be implemented and a SWPPP prepared to prevent siltation of surface water bodies. Beneficial impact on groundwater resources would result from the reduction of SCC potable water demands.	NPDES permit limitations for PCBs would be met during occasional discharges. As a mitigation measure, BMPs would be implemented and a SWPPP prepared to prevent the siltation of surface water bodies. Beneficial impact on groundwater resources would result from the reduction of SCC, LDCC, and TA-3 Power Plant potable water demands.	Continued headward erosion of the main drainage channel and potential for movement of PCBs, chromium, and other contaminants downstream.	Grade control structure would establish more controlled surface water flow by preventing channel erosion. Intermediate and regional groundwater conditions may be favorably affected by improved surface water quality below reach S-2.	Transport of contaminants by surface water would be eliminated or greatly reduced. Unlikely that groundwater conditions would be adversely affected. Intermediate and regional groundwater conditions may be favorably affected by improved surface water quality below reach S-2.

Table 4-1. Summary of Environmental Consequences for SERF and ER Alternatives

Resource Area	SERF Alternatives			ER Alternatives for Reach S-2		
	No Action	Partial Reuse	Total Reuse	No Action	Stabilization with Long-term Monitoring	Removal with Off-site Disposal
Ecological Resources	No impact	Reduced discharge from outfalls may result in change of wetland vegetative community to drier, upland species and may require wetland compensatory measures. TA-60 evaporation pond construction schedule would be subject to restrictions for T&E species and migratory bird breeding and nesting seasons. Other T&E species mitigation measures may result from consultation with the USFWS. Loss of 2 acres of Mexican spotted owl mesa-top core habitat.	Elimination of industrial discharges could result in reduction or elimination of wetland acreage and may require wetland compensatory measures. TA-60 evaporation pond construction schedule would be subject to restrictions for T&E species and migratory bird breeding and nesting seasons. Other T&E species mitigation measures may result from consultation with the USFWS. Loss of 2 acres of Mexican spotted owl mesa-top core habitat.	Channel cutting would continue to dry out portions of the wetland and result in change of vegetative community to drier, upland species.	Loss of vegetation would occur from clearing of access road and construction activities A grade control structure would allow the wetland to continue to function.	Loss of vegetation would occur from clearing of access road and construction laydown areas, and from canyon soil removal. BMPs would be implemented to minimize impact to game animals and other small mammals and birds. Affected areas would be reclaimed and planted with native plant species as a mitigation measure. Loss of wetland acreage would require wetland compensatory measures as a mitigation action. Suitable habitat present in the LANL area..
Cultural Resources	No impact	No impacts would occur. At least four archaeological sites have been recorded in the vicinity of the TA-60 evaporation ponds. Sites would be flagged and avoided as a mitigation measure.	No impacts would occur. At least four archaeological sites have been recorded in the vicinity of the TA-60 evaporation ponds. Sites would be flagged and avoided as a mitigation measure.	No impact	No impacts would occur. Four archaeological sites in the vicinity of reach S-2 would be flagged and avoided as a mitigation measure.	No impacts would occur. Four archaeological sites in the vicinity of reach S-2 would be flagged and avoided as a mitigation measure.

Table 4-1. Summary of Environmental Consequences for SERF and ER Alternatives

Resource Area	SERF Alternatives			ER Alternatives for Reach S-2		
	No Action	Partial Reuse	Total Reuse	No Action	Stabilization with Long-term Monitoring	Removal with Off-site Disposal
Climatology and Air Quality	No impact	Temporary localized increase in fugitive dust and all criteria pollutants from construction equipment emissions.	Temporary localized increase in fugitive dust and all criteria pollutants from construction equipment emissions.	No impact	Temporary localized increase in fugitive dust and all criteria pollutants from construction equipment emissions.	Localized increase in fugitive dust and all criteria pollutants from construction equipment emissions for about 16 months.
Noise	No impact	Temporary increase in daytime noise levels.	Temporary increase in daytime noise levels.	No impact	Temporary increase in daytime noise levels.	Temporary increase in daytime noise levels.
Human Health	No impact	Not anticipated to result in adverse effect on health of construction workers due to adherence to Health & Safety Plan and equipment inspections.	Not anticipated to result in adverse effect on health of construction workers due to adherence to Health & Safety Plan and equipment inspections.	No impact	Not anticipated to result in adverse effect on health of construction workers due to adherence to Health & Safety Plan, use of PPE, and equipment inspections	Not anticipated to result in adverse effect on health of construction workers due to adherence to Health & Safety Plan, use of PPE, and equipment inspections.
Utilities and Infrastructure	No impact	Small increase in electrical usage. Up to 60 percent savings in potable water used for cooling towers.	Small increase in electrical usage. Up to 75 percent savings in potable water used for cooling towers.	No impact	An access road would be constructed to allow installation of a grade control structure near the eastern end of reach S-2.	An access road would be constructed to allow removal of contaminated sediment and soils with a variety of heavy equipment.
Traffic and Transportation	No impact	Temporary increase in traffic in vicinity of SERF during construction.	Temporary increase in traffic in vicinity of SERF during construction.	No impact	Temporary increase in traffic associated with construction of access road and installation of grade control structure.	Between 5,000 and 10,000 off-site shipments of contaminated soils and equivalent number of in-bound shipments of clean fill over about 16 months.
Environmental Restoration and Waste Management	No impact	Up to 3 SWMUs would require additional investigation prior to construction of expanded SERF. Small increase in generation of nonhazardous waste.	Up to 3 SWMUs would require additional investigation prior to construction of expanded SERF. Small increase in generation of nonhazardous waste.	No impact	Some excavation of contaminated sediments likely during construction of access road and grade control structure. No SWMUs or AOCs directly affected other than Sandia Canyon.	Up to 100,000 yd^3 of contaminated sediments removed. Solid waste categories could involve RCRA hazardous waste, NM Special waste, PCB waste, and industrial waste.

CHAPTER 5

5.0 CUMULATIVE EFFECTS

Cumulative effects on any affected resources as a consequence of the SERF and ER Action Alternatives are expected to be negligible. Cumulative effects are caused by the aggregate of past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes them. These effects can result from individually minor, but collectively significant, actions taking place over a period of time (40 CFR 1508.7). The cumulative effect analysis in the LANL SWEIS already documents the regional effect of the Expanded Operations Alternative and provides context for this EA. This section considers the action alternatives and their possible effects on resources as relates to any ongoing or reasonably foreseeable future actions.

Five resource areas are dismissed from cumulative effects consideration because it has been determined they would not be affected by the SERF and ER Action Alternatives and therefore could not contribute collectively to ongoing or reasonably foreseeable actions (see Table 3-1). These were land resources, prime and unique farmland, socioeconomic resources, environmental justice, and visual resources. Seven other resources analyzed in this EA would not contribute significantly to cumulative effects, because the SERF and ER Action Alternatives would not have significant long-term or irreversible effects on geology and soils, water resources, cultural resources, air quality, noise, human health, and utilities and infrastructure. Some positive effects to water resources and to infrastructure and utilities would result from the SERF Partial Reuse and Total Reuse Alternatives.

Ecological resources, traffic and transportation, and environmental restoration and waste management are discussed further in this section. This analysis concludes that negligible cumulative effects would occur on these resources as a consequence of the aggregate of the Action Alternatives and past, present, and reasonably foreseeable future actions.

Ecological Resources

Sections 4.1.2.3, 4.1.3.3, 4.2.2.3, and 4.2.3.3 of this EA analyzed the effects of the four action alternatives on ecological resources at the SERF and in reach S-2.

Vegetation

All action alternatives include BMPs to replace vegetation disturbed by construction. Of the six alternatives analyzed in this EA, the Total Reuse Alternative and the Removal with Off-site Disposal Alternative are anticipated to directly or indirectly reduce or eliminate the largest amount of wetland vegetation in reach S-2. Under the Total Reuse Alternative, upland species would be expected to replace some or all of the wetland plants in the wetland in reach S-2 over a period of years, depending on the amount of water supplied by natural sources.

The Los Alamos County landfill is located on the north rim of Sandia Canyon above reach S-2, and a cap is being installed for that landfill. Stormwater runoff from this project, discharged into Sandia Canyon, could offset to an unknown degree the loss of effluent under the Total Reuse Alternative. The loss of wetland vegetation would not significantly contribute to impacts from other past, present, and reasonably foreseeable future actions.

Wildlife

Under either the Total Reuse Alternative or the Removal with Off-site Disposal Alternative, a localized decline would occur in the number of individuals of water-dependent small mammal and aquatic invertebrate species, and localized decrease would occur in biodiversity at the reach S-2 wetland. Little, if any, adverse effects are foreseen as a consequence of replacing some wetland vegetation with a greater proportion of upland species in reach S-2; a slight beneficial effect might exist for wildlife from the additional upland vegetation available for forage use.

A local reduction in elk density could occur at LANL, but this would not likely alter the overall pattern of elk movement, use, and numbers in the Jemez Mountains. No appreciable change is foreseen in elk and deer use of Bandelier National Monument, which is adjacent to LANL. Localized and short-term increases could occur in utilization by large mammals of particular water sources and habitat. More stabilized and defined use patterns would follow the period of adjustment. The impacts to wildlife identified in this EA would not significantly contribute to impacts from other past, present, and reasonably foreseeable future actions.

Wetlands

The Total Reuse Alternative and the Removal with Off-site Disposal Alternative would reduce up to about 3 acres (1.2 hectares) of wetland vegetation, but areas of wetland vegetation would be expected to persist at other wetlands at LANL (USACE 2005). The elimination of the reach S-2 wetland would represent about 10 percent of the total LANL wetlands, totaling about 34 acres (13.8 hectares) (USACE 2005). The loss of the reach S-2 wetland would not significantly contribute to impacts from other past, present, and reasonably foreseeable future actions.

Traffic and Transportation

Cumulative effects to transportation are assessed by combining the number of trips anticipated to be generated by the proposed corrective measures with the transportation impacts of other existing and planned developments. Of the four action alternatives considered in this EA, only the traffic and transportation analysis for the Removal with Off-site Disposal Alternative identifies a substantial increase in trips from 5,000 and 10,000 off-site shipments of contaminated soils in reach S-2, and an equivalent number of in-bound shipments of clean fill, over about 16 months.

Some other projects that could result in increased traffic on roadways include the:

- Los Alamos County landfill cap on the north rim of Sandia Canyon above reach S-2,
- Proposed (but not NNSA- approved) photovoltaic Los Alamos County array on the landfill cap on the north rim of Sandia Canyon above reach S-2, and
- The CMRR Nuclear Facility and a number of other projects along Pajarito Road that could restrict traffic along this road.

If these construction and demolition projects were to take place in the same time frame as the proposed corrective measures described in this EA, additional construction traffic analyzed in Section 4.2.3.9 could have an effect on the traffic flow along East Jemez Road and Diamond Drive (which connects Pajarito Corridor to East Jemez Road). It is estimated that the upper limit of 50 truck loads per day and an equal number of returning empty trucks is approximately 1.0 percent of the average daily traffic flow of 9,502 trips at the intersection of East Jemez Road at NM 4 (DOE 2008).

Trucks transporting sediments and soils above specified action levels would need to be coordinated with other truck traffic if the Removal with Off-site Disposal Alternative were selected and if it occurred at the same time of these other projects. However, these types of activities rarely occur at the same time. These transportation effects would not significantly contribute to impacts from other past, present, and reasonably foreseeable future actions.

Environmental Restoration and Waste Management

The Removal with Off-site Disposal Alternative would result in the generation of large volumes—up to 100,000 yd^3 (76,570 m^3)—of solid waste. The waste could be placed in various categories depending on the contaminant types and concentrations. Possible waste classifications include but are not limited to RCRA hazardous waste, New Mexico Special Waste, TSCA-regulated PCB waste, and industrial waste. When added to the much larger volume of environmental restoration waste at LANL, these waste management effects would not significantly contribute to impacts from other past, present, and reasonably foreseeable future actions.

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CHAPTER 6

6.0 AGENCIES CONSULTED AND COMMENTS

The U.S. Army Corps of Engineers (USACE), U.S. Fish and Wildlife Service (USFWS), New Mexico Environment Department (NMED), New Mexico Department of Game & Fish, San Ildefonso Pueblo, Santa Clara Pueblo, Jemez Pueblo, Cochiti Pueblo, Acoma Pueblo, and Mescalero Apache Tribe were invited to participate in the review of this EA, and were offered briefings if so desired. Briefings were provided to Santa Clara Pueblo on April 27, 2010, and to San Ildefonso Pueblo on April 29, 2010. All agencies received copies of the Draft EA for their review and comment.

The USACE accepted an invitation to be a cooperating agency. The USACE will also review a wetland delineation of a wetland in reach S-2 that may be regulated under the provisions of Section 404 of the *Clean Water Act*.

Consultation is required through the USFWS under the provisions of Section 7 of the *Endangered Species Act* for actions minimally determined to potentially affect, but not adversely affect, threatened or endangered species or their critical habitats. A biological assessment for the subject actions was prepared and submitted to the USFWS for informal consultation. The USFWS, in a letter dated July 23, 2010, concurred with the determination that the proposed action “may affect, but not likely to adversely affect” the Mexican spotted owl."

The NMED declined an invitation to be a cooperating agency, but will be the decision maker for the ER Action Alternative. DOE will make associated implementing decisions for the ER actions selected by NMED.

A floodplains and wetlands assessment of the Proposed Action has been prepared and is included as Appendix A of this EA. This is in accordance with DOE regulations regarding floodplain/wetlands environmental review requirements pursuant to 10 CFR 1022.

The LASO Cultural Resources Manager determined that the subject activities would not affect recorded historic or prehistoric resources through avoidance. The LANL CRMP, as implemented at LANL, serves to identify and protect historic and cultural resources, as well as provide a framework for consultation with and visitation of resources by local tribes and pueblos. Per the provisions of this Management Plan, consultation with the New Mexico SHPO, pursuant to Section 106 requirements of the NHPA for actions that would result in no effect to a cultural resource site through avoidance, is not required to be completed prior to implementing the subject actions.

The USACE, in a letter dated August 10, 2010, stated under the Stabilization in Place with Long-Term Monitoring Alternative or the Removal with Off-site Disposal Alternative that "the discharge of dredged or fill materials in the Sandia Canyon stream channel or wetland would require a Department of the Army permit under Section 404 of the *Clean Water Act*."

San Ildefonso Pueblo, in an e-mail dated August 10, 2010, stated that the only alternative with "any possibility for consequences to the Pueblo would be No Action for reach S-2, which would allow continued head-cutting and eventually mobilization of contaminants." The Pueblo also commented because the Total Reuse Alternative would lead to some dewatering of the wetland, "this alternative should be paired with either the grade control structure, or the removal of contaminated sediments alternative."

The NMED, in a letter dated July 30, 2010, provided a number of comments concerning the alternatives being considered. The Air Quality Bureau stated that "it is important that all facilities contracted in conjunction with this project have current and proper air quality permits." The Ground Water Quality Bureau (GWQB) stated that "this [SERF] project does provide a path for LANL to significantly off-set potable water demand through increased beneficial reuse, thus preserving the scarce water resources in this area. Because of this, GWQB is supportive of the options in the report that result in increased reuse." The Hazardous Waste and DOE Oversight Bureaus stated "with regard to the environmental restoration activities at the wetland, NMED will require the Stabilization in Place with Long-Term Monitoring option. Regarding the proposed SERF alternatives, NMED prefers the Partial Reuse option, which is capable of delivering sufficient water to the wetland so that the health and stability of the wetland are maintained. An Interim Measures work plan will be required for corrective action at the wetland." The Surface Water Quality Bureau (SWQB) stated that "permittees must ensure that there is no increase in sediment yield and flow velocity from the construction site (both during and after construction) compared to preconstruction, undisturbed conditions. SWQB further believes that analytical monitoring must be conducted at appropriate frequencies and locations during the project and, particularly in the case of the stabilization in place alternative, after the project is completed." Section 4.2.2.2 (Stabilization in Place with Long-term Monitoring - Water Resources) and Section 4.2.3.2 (Removal with Off-site Disposal - Water Resources) of the Final EA have been revised in an attempt to address water resource comments.

CHAPTER 7

7.0 REFERENCES

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APPENDICES

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APPENDIX A – FLOODPLAIN ASSESSMENT

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Floodplain Assessment of Proposed Remediation and Effluent Discharge Actions in Sandia Canyon, Los Alamos National Laboratory

June 1, 2010

LA-UR-10-03754

Introduction

Los Alamos National Laboratory (LANL) is preparing to conduct remediation actions in Sandia Canyon as directed by the New Mexico Environment Department (NMED) under the 2005 Order on Consent (Consent Order). In addition, LANL is preparing to meet new and more stringent water quality requirements for wastewater discharges and to reduce the amount of potable water it uses by reducing the amount of effluent discharged into Sandia Canyon.

LANL biologists conducted a floodplain determination—this project is partially located within a 100-year floodplain. There is an approximate three-acre wetland located within the affected area (Figure 1).

Project Description

Remediation Actions

For purposes of this assessment, LANL is considering the range of remediation options that may be required by NMED. The Sandia Canyon wetland sediments contain approximately 80 percent to 90 percent of the entire inventory of chromium and polychlorinated biphenyls (PCBs) within Sandia Canyon. Remediation is expected to consist of either stabilization of the contaminants in place within the wetland area or removal of contaminated soils.

To stabilize contaminants in place, LANL may construct a grade control structure similar to those already in place in DP Canyon (Figure 2) and Pueblo Canyon. A grade control structure is composed of wire gabions filled with rock with a low-flow weir and an overflow weir. The five-year flow is used to develop the width of the low-flow weir. The 100-year flow is used to determine the rest of the weir dimensions (the overflow weir and confinement walls) and to calculate the energy dissipation (stilling) basin dimensions and end sill heights.

A perforated and slotted riser pipe is placed approximately 50 feet upstream of the structure to assist in releasing water stored upstream. This pipe is connected to an outfall pipe that goes through the gabion structure and outlets to the stilling basin or plunge pool to let the water drain at a slow measured pace.

If needed, an additional structure of perforated metal plates may be placed in the alluvium to disperse subsurface flow to maintain saturated or moist soil conditions over a larger area than would otherwise occur.

Alternatively, NMED may direct the removal and disposal of contaminated soils as waste. If LANL is directed to excavate and remove contaminated soils, up to 100,000 cubic yards of soils and sediment would be containerized, characterized for waste management, and transported to an appropriate licensed off-site disposal facility. The area would be restored using clean fill and native plants. Most or perhaps all of the restored area would likely support upland vegetative communities rather than a wetland.

Both alternatives would likely require construction of a one-lane unpaved road to reach the eastern end of the wetland area. The road would have truck and heavy equipment traffic.

Effluent Discharge

Sandia Canyon currently has five permitted outfalls that discharge industrial and sanitary effluent. Between July 2007 and June 2008, 389 acre-ft/yr of water was discharged from these outfalls and 130 acre-ft/yr was contributed by storm water runoff and snowmelt. As a rough estimate, approximately 75 percent of the current flow in upper Sandia Canyon is from effluent outfalls and 25 percent is from precipitation runoff. LANL is planning on expanding the capacity of its Sanitary Effluent Recycling Facility (SERF). Once the expanded SERF is fully operational, effluent discharges into Sandia Canyon may be reduced to zero, except for times when cooling towers or boilers are shut down for maintenance. The only source of water flowing into the Sandia Canyon wetlands would be storm water runoff and snowmelt.

Floodplain Impacts

Under the maximum impact scenario (excavation of 100,000 cubic yards of soil), up to 15 acres of land may be disturbed for road construction, laydown areas, and soil removal, including approximately four acres within the 100-year floodplain of Sandia Canyon. The three-acre wetland may be reduced in size or disappear entirely. If wetland soils are stabilized instead, the current wetland size may be maintained, and the area disturbed within the floodplain and/or wetland would likely be reduced to one acre or less. The completed project will reduce the amount of potentially contaminated soil leaving LANL property and the migration of contaminants into groundwater.

Reduction or elimination of effluent discharge is not expected to impact the floodplain in Sandia Canyon. However, the three-acre wetland may be reduced in size or disappear entirely.

Mitigation identified for remediation alternatives will be implemented along with adaptive resource management practices through a National Environmental Policy Act Mitigation Action Plan with annual reporting requirements. Best management practices for soil erosion control and floodplain protection would be implemented during any project activities. For any construction or excavation, a National Pollution Discharge Elimination System (NPDES) General Notice of Intent would be filed, and a Storm Water Pollution Prevention Plan would be implemented. Activities that adversely impact the wetland will be mitigated through wetland restoration or enhancement, either on-site or at nearby locations, or through participation in a mitigation bank or in-lieu of fee mitigation agreements.

Other Alternatives Considered

No Action

Under the No Action alternative, the SERF upgrades would not be implemented and the existing SERF would be operated to treat approximately 100,000 gallons per day of Sanitary Wastewater System (SWWS) Plant effluent. In addition, the National Nuclear Security Administration (NNSA) would undertake no remediation activities in upper Sandia Canyon. However, monitoring and investigation of site conditions and site contamination would continue as directed by the Consent Order or subsequent NMED direction. The remainder of the SWWS Plant effluent would continue to be discharged to Sandia Canyon via Outfall 001. NPDES effluent limitations for PCBs would not be met and LANL would be in violation of its NPDES permit and subject to fines, or NNSA and Los Alamos National Security, LLC, would need to renegotiate the permit.

The No Action alternative does not meet LANL's need to comply with Consent Order directives, to meet new effluent water quality requirements, or to conserve water.

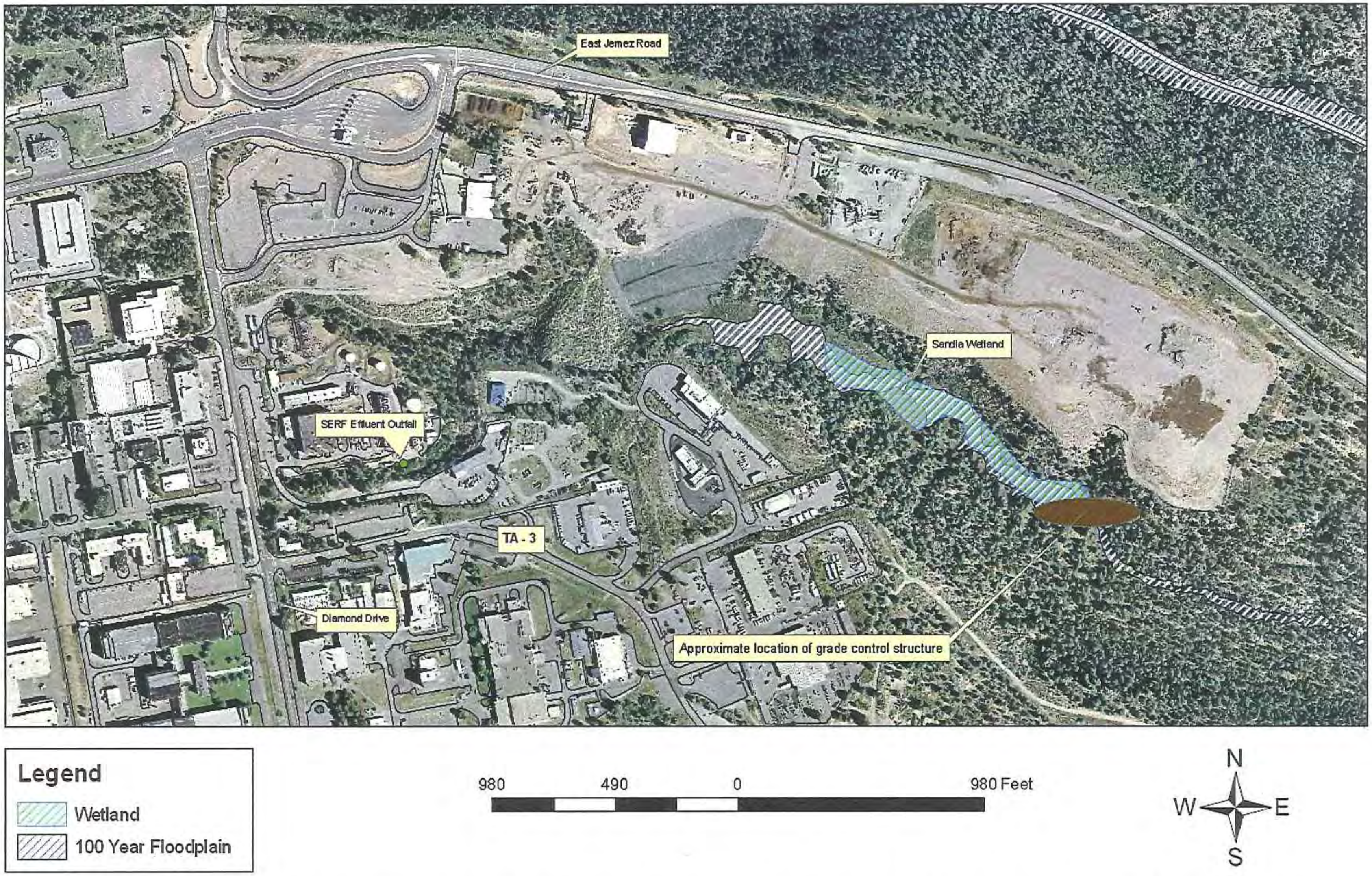

Figure 1. Orthophoto map showing location of Sandia wetland, approximate location of potential grade control structure, and the 100-year floodplain in Sandia Canyon.

Figure 2. Grade control structure in DP Canyon, looking downstream.

APPENDIX B – DRAFT MITIGATION ACTION PLAN

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Mitigation Action Plan
for the Expansion of the Sanitary Effluent Reclamation Facility and Environmental Restoration of Reach S-2 of Sandia Canyon at Los Alamos National Laboratory, Los Alamos, Los Alamos, New Mexico

Background Information: The U.S. Department of Energy (DOE), National Nuclear Security Administration (NNSA) has issued a Finding of No Significant Impact for the Environmental Assessment (EA) (*Environmental Assessment for the Expansion of the Sanitary Effluent Reclamation Facility and Environmental Restoration of Reach S-2 of Sandia Canyon at Los Alamos National Laboratory, Los Alamos, New Mexico*, (DOE/EA-1736), on a proposal to expand the size and operational capacity of the Sanitary Effluent Reclamation Facility (SERF), and for possible environmental restoration action measures that may be taken within reach S-2 of Sandia Canyon at Los Alamos National Laboratory (LANL). Based on the analysis of potential environmental impacts presented in the EA, neither the construction or operation of the expanded SERF considered in the two action alternatives for that facility (namely, the Partial Reuse and the Total Reuse Alternatives), nor the environmental restoration action measures considered in the two action alternatives for reach S-2 of Sandia Canyon (namely, the Stabilization in Place with Long-term Monitoring and the Removal with Off-site Disposal Alternatives) would have significant environmental impacts. This conclusion is explained in the FONSI issued on August 24, 2010.

As described in the subject EA, the SERF facility would be expanded physically to accommodate additional wastewater treatment equipment, new storage tanks would be installed, as would additional piping to deliver wastewater for treatment and to redistribute the treated wastewater for reuse at appropriate LANL facilities. Additionally, appropriate environmental restoration action measures will be determined by the State of New Mexico's Environment Department (NMED) under the provisions of the 2005 Compliance Order on Consent for LANL cleanup to address legacy contamination present in the upper reach of Sandia Canyon. The actions determined to be needed by NMED for the reach S-2 area would be implemented by the DOE and may consist of any of the actions analyzed in the EA, from taking no actions except long-term monitoring of the site conditions, to stabilization in place with long-term monitoring, or complete soil removal with off-site disposal. The potential environmental restoration action measures implemented could also consist of any combination or degree of these actions as well. To facilitate and implement the action measures, DOE would need to store equipment and supplies at sites it determines to be appropriate for lay-down work areas; may need to construct access roads or enhance existing roads to move heavy machinery into place; and may need to implement various engineering activities in a phased approach over various portions of reach S-2. Additionally, NMED could require action taken in the canyon be implemented in phases or at certain times of the year to enhance the contaminant stabilization process or address other specific site issues. The implementation of adaptive resource management practices and continual site monitoring in Sandia Canyon would be coordinated to mitigate potentially adverse environmental effects.

Environmental Effects: The impact analysis provided in the EA indicates that potential beneficial or adverse effects of the subject SERF project and the environmental restoration action measures would be minimal under normal conditions. The EA description of alternatives and the analysis of environmental effects, however, include the recognition of certain provisions that would effectively mitigate potential adverse effects that could result either directly, indirectly or cumulatively from implementing the subject activities.

Possible adverse environmental effects on natural resources present in and near reach S-2 of Sandia Canyon are as follows:

(1) effects on potential habitat of Federally threatened or endangered species, such as the Mexican spotted owl;

(2) effects on wildlife, birds, and game animal use of the canyon area;

(3) effects on wetland conditions and vegetation;

(4) effects on surface and groundwater quality; and

(5) effects on cultural resources or Traditional Cultural Properties located in or near the project or environmental restoration work sites.

Function of the Mitigation Action Plan: This Mitigation Action Plan (MAP) contains mitigation and monitoring commitments related both to the construction activities and enhanced operation of SERF, and for environmental restoration action measures within reach S-2 of Sandia Canyon that will be selected by the NMED and implemented by DOE. Adaptive resource management practices[1] incorporated into LANL's Environmental Management System (EMS) Action Plans will serve to integrate the impacts of the two actions as they apply to the natural resources present within Sandia Canyon and nearby locations. The commitments made in this MAP are designed to mitigate any adverse environmental consequences (even though they are not significant) associated with the expanded SERF and the environmental restoration action measures as these are implemented, and as direct, indirect and cumulative impacts from these actions occur over time to the resources in the upper end of Sandia Canyon. Adaptive resource management practices are applied to projects or programs across the design, management, implementation, and monitoring stages to systematically check impact assumptions as the actions progress; changes may be made to the activities to ensure the efficacy of the mitigation techniques in an iterative fashion.

Mitigation Action Plan Annual Reporting: Although the text of this MAP is included as Appendix B of the subject EA, it is also being issued as a stand-alone document to facilitate its implementation. After issuance, the mitigation measures committed to by this MAP will be folded into the overarching *2008 Site-Wide Environmental Impact Statement for the Continued Operation of Los Alamos National Laboratory (DOE/EIS 0380) Mitigation Action Plan (SWEIS MAP).* Annual reporting of the mitigation activities taken and their implementation status, as well as their effectiveness for accomplishing the intended mitigation of adverse effects, will be met through publication as a part of the SWEIS MAP status reports and the MAP Annual Report (MAPAR), or other annual reporting documents with prior NNSA approval (such as the annual

[1] Adaptive resource management practices are structured, iterative processes aimed at evaluating results and adjusting actions based on what has been learned, providing feedback between system monitoring and decisions, characterization of system uncertainty though multi-model interface, and embracing risk and uncertainty as a way of building understanding. These practices are particularly applicable for systems in which learning via experimentation is impractical.

LANL Environmental Surveillance Report or the SWEIS Yearbook[2]). As details of specific mitigation activities required for these subject activities are further developed, or as additional mitigation actions are identified as being necessary, the SWEIS MAP will be updated accordingly. NNSA may amend the SWEIS MAP at any time to address changing needs or in response to changing site conditions.

This MAP and related SWEIS documentation, including the subject EA, will be made available at the following Websites:

- http://nepa.energy.gov/mitigation_action_plans.htm
- http://www.doeal.gov/laso/NEPADocuments.aspx
- http://www.lanl.gov/environment/risk/

Responsible Parties: The NNSA, Los Alamos Site Office Manager will have the overall responsibility for insuring the adequate and timely completion of all activities associated with this MAP. The LANL Principal Associate Director for Operations and Business, as a Los Alamos National Security, LLC (also known as LANS, which is the current management and operations contractor for LANL) representative, will be responsible for the overall work assignments for conducting the mitigation measures performed by LANS personnel (or sub-contractors) and conducting project-specific activities identified for each SERF and environmental restoration action measure. This responsibility includes certain data collection, monitoring activities, and other actions that may be split between LANL Associate Directors and/or Divisions. NMED will direct DOE and LANS, or will concur on actions they take to investigate and potentially remediate contaminant movement or cleanup in the Sandia Canyon; DOE will implement corrective action measures as required and deemed necessary.

Mitigation Activities: The mitigation activities identified in the following table address all phases of the project, from planning and design, through construction, and into facility operation as appropriate. As some mitigation activities are applicable to more than one phase of the SERF project or the environmental restoration action measures, the tasks associated with each activity may be implemented in an iterative fashion over time at the discretion of the responsible parties. As mitigation activities are completed and deemed fully successful in meeting the mitigation goals, the activities shall be identified as closed. The NNSA may initiate certain mitigation measures or required permitting actions in advance of the project or environmental restoration action measures, as appropriate. As the subject activities progress from planning, through construction, operations, or close-out activities, additional laws and mitigation measures may be triggered during any phase of the work (such as, if cultural resources are encountered during land excavation; or if federally protected threatened or endangered species move into the work site area or if species become listed for protection and must, therefore, be taken into consideration). DOE and NNSA recognize the obligation to comply with such laws and other requirements although they may not specifically be referenced in the following table.

[2] The SWEIS MAP annual report is presented as part of the LANL SWEIS Yearbook, which is posted on-line each year at the following Website: http://www.lanl.gov/environment/nepa/sweis.shtml?1

Affected Environment	Mitigation Action	Purpose	Party Responsible for Implementing	Status
Biological Resources				
• Threatened and Endangered Species potential habitat	All reasonable and prudent measures identified during the informal consultation process with the US Fish and Wildlife Service for these actions will be implemented. These include following the LANL Threatened and Endangered Species Habitat Management Plan restriction on noise generation for the lagoon construction work at TA-60, and using appropriate erosion and runoff controls at all project construction locations, and augmented with other provisions as necessary to address specific site issues as the SERF project and environmental restoration action measures are implemented. Both temporary and permanent site lighting will comply with the New Mexico Night Sky Act, and to the extent practicable, will be directed away from the canyon area or potential habitat areas.	To minimize negative impacts to protected species or their prey species, and to avoid disturbances to the successful reproductive cycles of protected species.	LANS	Open
• Game animals and other small mammals and birds	Best Management Practices (BMPs) identified for sensitive species protection and for migratory bird protection at LANL will be followed and may be augmented to address specific site issues as the SERF project and environmental restoration action measures are implemented. After soil disturbing activities have been completed, disturbed sites will be restored with re-contouring and planted with a native seed mix or native vegetation plantings as appropriate. The sites would be monitored and re-seeded as necessary to achieve at least 50 percent vegetative coverage.	To re-establish habitat suitable for grazing and other life-cycle activities quickly to minimize disturbance to migration and use patterns; to avoid reproductive failures for actively nesting bird species.	LANS	Open

Affected Environment	Mitigation Action	Purpose	Party Responsible for Implementing	Status
• Wetlands	Activities that must be taken within the reach S-2 wetland to effect site contamination stabilization, soil removal, or that are taken to enhance the quality of the wetland hydrologic profile, or conversely, that eliminate essential effluent discharge necessary to support the wetland vegetation, will be mitigated through wetland restoration or enhancement, either on-site or at nearby LANL locations (such as on neighboring lands administered by the Department of the Interior, Department of Agriculture, or belonging to the Pueblos of Santa Clara or San Ildefonso), or through participation in a mitigation bank or in-lieu fee mitigation agreement[3]. Where appropriate, wetland and floodplain best management practices will be followed and may be augmented to address specific site issues as the SERF project and environmental restoration action measures are implemented.	To minimize negative wetland impact or wetland loss, and to enhance the overall quality of wetland values and functionality. Mitigation will comply with 10CFR Part 1022, Executive Orders 11988 and 11990 (as appropriate) and the Clean Water Act, Section 404.	LASO and LANS	Open
• Surface and Groundwater Quality	Develop and use BMPs (such as silt fencing, straw bales, rock gabions, and steel pilings, or baffle installations) to prevent or lessen the movement of sediments from disturbed areas during construction, or to lessen the movement of contaminated silt during the implementation of environmental remediation action measures, or wetland enhancement activities in Sandia Canyon.	To minimize impacts to the environment associated with stormwater and snow melt runoff or runon, and comply with the NPDES Construction General Permit for Stormwater Discharge.	LASO and LANS	Open
• Cultural resources and Traditional Cultural Properties	LANL Cultural Resources Management Plan provisions will be followed and may be augmented to address specific site issues as the SERF project and environmental restoration action measures are implemented. If buried archeological resources, remains, or items of cultural significance are encountered during construction, site activities would cease until their significance was determined by a trained archaeologist and appropriate actions taken. If traditional cultural properties are identified at the SERF construction site or the reach S-2 environmental restoration site, site activities will cease until appropriate mitigation measures can be determined through consultation with the State Historic Preservation Officer and the involved Tribal government.	Comply with Section 106 of the National Historic Preservation Act, which requires federal agencies to take into account the effects that federally funded activities and programs have on significant historic properties including cultural and archaeological resources and traditional cultural properties and practices.	LANS and LASO (for consultation with Tribal governments and the State Historic Preservation Officer)	Open

Provisions of this MAP will be effective immediately.

[3] Mitigation banks are trust funds established for payment of fees where on-site mitigation is not, or cannot be, implemented. The in-lieu fee is payment made to a mitigation bank in compensation for impacts to water resources. The fee is then used by the managers of the trust to improve or expand water resources in other locations.