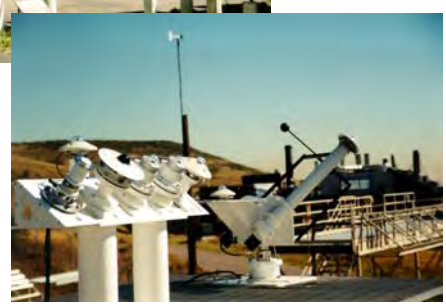
DOE/EA # 1440

FINAL

Site-Wide Environmental Assessment of the National Renewable Energy Laboratory's South Table Mountain Complex



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U.S. DEPARTMENT OF ENERGY
GOLDEN FIELD OFFICE
NATIONAL RENEWABLE ENERGY LABORATORY
1617 Cole Boulevard
Golden, Colorado 80401

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AFUF	Alternative Fuels User Facility
APEN	Air Pollution Emission Notice
ART	Advanced Research Turbine
AST	Aboveground Storage Tank
BMP	Best Management Practice
BTRF	Biotechnology Research Facility
CAQCC	Colorado Air Quality Control Commission
CAQCD	Colorado Air Quality Control Division
CART	Controls Advanced Wind Turbine
CDOT	Colorado Department of Transportation
CDPHE	Colorado Department of Public Health and Environment
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CESQG	Conditionally Exempt Small Quantity Generator
CFR	Code of Federal Register
CMWC	Consolidated Mutual Water Company
CO	Carbon Monoxide
CWTP	Countywide Transportation Plan
DAB	Design Advisory Board
dB	Decibel
dBA	Decibels, Ambient Level
DER	Distributed Energy Resources
DERTF	Distributed Energy Resources Test Facility
DOE	Department of Energy
DOE GO	Department of Energy, Golden Field Office
DRCOG	Denver Regional Council of Governments
DWOP	Denver West Office Park
EERE	Energy Efficiency and Renewable Energy
EPA	Environmental Protection Agency
EPAct	Energy Policy Act (EPAct of 1992)
EPCRA	Emergency Planning and Community Right to Know Act
ESA	Endangered Species Act
ES&H	Environmental Safety and Health
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
FTLB	Field Test Laboratory Building
EA	Environmental Assessment
EIS	Environmental Impact Statement
FY	Fiscal Year (Oct. 1 to Sept. 30)
GDP	General Development Plan
GHG	Green House Gas
GLUP	General Land Use Plan
GO	Golden Field Office
gpm	gallons per minute
HAP	Hazardous Air Pollutant
HVAC	Heating, Ventilation, and Air Conditioning
IT	Information Technology
ITE	Institute of Transportation Engineers

IUF	Industrial Users Facility
kW	Kilowatt
kV	Kilovolt
LEED	Leadership in Energy and Environmental Design
LOS	Level of Service
MCL	Maximum Contaminant Level
mg/L	Micrograms per Liter
MOU	Memorandum of Understanding
mph	Miles Per Hour
MPO	Metropolitan Planning Organization
MW	Megawatt
NAAQS	National Ambient Air Quality Standards
NASA	National Aerospace and Science Administration
NEPA	National Environmental Policy Act
NESHAPS	National Emission Standards for Hazardous Pollutants
NOx	Oxides of Nitrogen
NREL	National Renewable Energy Laboratory
NWTC	National Wind Technology Center
OAHP	Office of Archeology and Historic Preservation
OSHA	Occupational Safety and Health Administration
OTF	Outdoor Test Facility
PD	Planned Development
PDIL	Process Development Integration Laboratory
PDU	Process Development Unit
PM-10	Particulate Matter of 10 microns or less
PSCo	Public Service of Colorado (aka: Xcel Energy and New Century Energies)
PSD	Prevention of Significant Deterioration
psig	pounds per square inch gauge
PV	Photovoltaic
PVC	Polyvinyl Chloride
RFETS	Rocky Flats Environmental Technology Site
RTD	Regional Transportation District
RTP	Regional Transportation Plan
S&R	Shipping and Receiving
S&TF	Science and Technology Facility
SARA	Superfund Amendments and Reauthorization Act
SCS	Soil Conservation Service
SERF	Solar Energy Research Facility
SERI	Solar Energy Research Institute
SHPO	State Historic Preservation Officer
SOx	Oxide of Sulfur
SO_2	Sulfer Dioxide
SPCC	Spill Prevention Control and Countermeasures
SPPPCA	Stormwater Pollution Prevention Program for Construction Activities
SRRL	Solar Radiation Research Laboratory
STM	South Table Mountain
SVOC	Semi-Volatile Organic Compounds
TCPDU	Thermo Chemical Process Development Unit
TIP	Transportation Improvement Plan
TPY	Tons Per Year

TTF	Thermal Test Facility
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
VFD	Variable Frequency Drive
VOC	Volatile Organic Compounds

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S. SUMMARY

S.1 INTRODUCTION

The National Renewable Energy Laboratory (NREL) is one of ten Department of Energy (DOE) national laboratories and is dedicated to the research, development, and technology transfer of renewable energy and energy efficiency technologies. The DOE Solar Energy Research Institute, founded in 1977, achieved national laboratory status and became NREL in 1991. The Midwest Research Institute and their subcontractors, Battelle Memorial Institute and Bechtel Corporation, operate NREL for DOE. The laboratory is comprised of three main sites: 1) South Table Mountain (STM); 2) Denver West Office Park (DWOP), and 3) The National Wind Technology Center (NWTC). The STM and DWOP sites are referred to as the STM complex and are the subjects of this environmental document. Future plans for the NWTC have been assessed in a separate National Environmental Policy Act (NEPA) process that was completed in May 2002.

In accordance with DOE NEPA implementing regulations, DOE is required to evaluate the Site-Wide Environmental Assessment (EA) after five years and annually thereafter to determine whether the documentation and findings continue to adequately address current agency plans, functions, programs, and resource utilization with respect to environmental impacts. A Site-Wide EA for NREL's STM site was published in 1993 (DOE-EA-0620). Since 1993, DOE and NREL have reviewed the EA for continued relevance to ongoing activities and NEPA compliance. In 2002, DOE determined that a new comprehensive Site-Wide EA should be prepared for the STM complex to address new improvements and on-site activities at the STM and DWOP sites and proposed improvements associated with changes in the STM site's boundaries.

In compliance with NEPA (42 United States Code (U.S.C.) 4321) and DOE's NEPA implementing regulations (10 Code of Federal Regulations (CFR) section 1021.330), this Site-Wide EA examines the potential environmental impacts of site operations; a program of proposed improvements at the NREL sites, and a No Action Alternative.

The Proposed Action is to operate the STM site for alternative energy research with new and improved capabilities to support DOE's mission to research, develop and transfer to industry renewable energy technologies. The Proposed Action consists of new activities and new and modified facilities. Construction would include permanent physical improvements to the site that involve buildings and equipment, utilities, and other infrastructure. Implementation of the Proposed Action is expected to occur between 2003 and 2008.

The No Action Alternative would leave the STM in its current configuration, add no new facilities, and maintain current levels of research, operation and management activities.

S.1.1 Purpose and Need

The purpose of the Proposed Action is to support DOE's mission in the research and development of energy efficiency and renewable energy technologies. DOE's Office of Energy Efficiency and Renewable Energy (EERE) leads the national research effort to develop clean, competitive, and reliable energy technologies for the 21st century. The goal of the EERE program is to improve the Nation's overall economic strength and competitiveness, energy security, and environmental health through the development of clean, competitive, and reliable

power technologies. The purpose and need for the Proposed Action is to provide and maintain enhanced facilities and infrastructure that would adequately support state-of-the-art alternative energy research. These improvements are needed to allow for growth of NREL's research programs.

S.1.2 Project Site, Proposed Action and Alternatives

The 327-acre STM site is located on the southeast side of South Table Mountain, north of Interstate 70 (I-70) and west of the I-70 and Denver West Boulevard interchange in unincorporated Jefferson County, near Golden, Colorado. Only 136 acres of the site is available for development. A total of 177 acres is protected by a conservation easement. Development on the remaining 14 acres is restricted by utility easements. There are currently six laboratory facilities, a few small test facilities, and several support buildings on the site. The STM site includes acreage on the South Table Mountain mesa top, slope, and toe, and was formerly part of the Colorado National Guard facility, established between 1903 and 1924, at Camp George West.

The DWOP site is located east of the STM site in the vicinity of the I-70/Denver West Boulevard interchange near Golden, Colorado. DOE and NREL occupy three buildings located at the eastern end of the office complex (Buildings 15, 16, and 17) and one building (Building 27) located north of I-70 just east of the STM site. The DWOP provides administrative offices and space for limited laboratory activities.

The Proposed Action is to operate the STM complex for alternative energy research with new and improved capability to support DOE's mission to research, develop and transfer to industry renewable energy technologies. The Proposed Action consists of new activities and new and modified facilities. Construction would include permanent physical improvements to the site that involve buildings and equipment, utilities, and other infrastructure. Implementation of the Proposed Action is expected to occur between 2003 and 2008.

The actual components and implementation schedule for the site improvements are dependent on federal budgeting decisions and fluctuating priorities. Therefore, the Proposed Action is described in general rather than specific terms, and only some portion of the Proposed Action components would be expected to be in place prior to or by 2008. At this time, there is no certainty over which of the many Proposed Action components would be funded and implemented, with one exception. This exception is the proposed Science and Technology Facility (S&TF). The preliminary design and location of the S&TF are known and described in Section 2.1.2. The designs and locations of other proposed facilities are uncertain, so various options are possible. Consequently, specific details are subject to modification, and the analyses in this EA allow for future flexibility.

These proposed improvements and activities are presented in four categories, as follows:

1. Construction of New and Modification of Existing Facilities and Research Areas;
2. Infrastructure Modifications and Improvements;
3. Potential Growth in Research Areas; and
4. Operation and Maintenance of New and Modified Facilities.

For purposes of Site-Wide environmental review, the 2008 scenario includes "bounding analysis" assumptions that represent likely site "buildout" conditions.

Given the intent of this Site-Wide EA, scoping input, and preliminary impact findings, the only alternative to the Proposed Action analyzed in this EA is the No Action Alternative.

NREL's environmental commitments are described in Chapter 1 and listed in Appendix A.

S.1.3 Characteristics of a Site-Wide Environmental Assessment

This document is a "Site-Wide Environmental Assessment" similar to the document NREL prepared for the STM site in 1993. DOE defines a Site-Wide environmental document as follows:

> "A broad-scope Environmental Impact Statement (EIS) or EA that is *programmatic* in nature and identifies and assesses the individual and cumulative impacts of ongoing and reasonably foreseeable future actions at a DOE site." (10 CFR Part 1021)

NEPA and other environmental regulations define the term "programmatic" and the application of programmatic environmental documents. In general, a programmatic document applies to a series of related projects and where the projects should be analyzed as an overall program. This approach is proper for analyzing a series of projects that are related either:

1. Geographically,
2. As logical parts in a chain of contemplated actions,
3. In connection with the issuance of rules, regulations, plans or other general criteria to govern the conduct of a continuing program, or
4. As individual activities carried out under the same authorizing statutory or regulatory authority and have generally similar environmental effects which can be mitigated in similar ways.

The Proposed Action, as described in Chapter 2, is composed of improvements that are related geographically and are part of a series of interconnected actions to be implemented by NREL.

This Site-Wide EA provides an analytical superstructure for subsequent, more detailed analyses, as necessary. The document will serve as a planning tool that aids decisions about future development of the site. As details are developed in the future, NREL will conduct subsequent environmental reviews that would incorporate the analyses from this programmatic document. Future reviews would be focused only on those issues that have not been adequately addressed.

In addition to the NEPA reviews, DOE requires that Site-Wide NEPA documents be evaluated periodically by means of a "Supplemental Analysis." The Supplemental Analysis determines whether the Site-Wide EA remains adequate or a new Site-Wide NEPA document is required. NREL is scheduled to prepare the next Supplemental Analysis in 2008.

The Environmental Management Matrix in Section 4.17 highlights key issues for individual improvements.

S.1.4 Organization and Content of the Environmental Assessment

This EA is organized in a manner consistent with NEPA and DOE's NEPA Implementing Regulations, including the specific guidelines for Site-Wide EAs. The EA has six Chapters:

- Summary
- Chapter 1 Introduction
- Chapter 2 Proposed Action and Alternatives
- Chapter 3 Affected Environment
- Chapter 4 Environmental Consequences and Mitigation Measures
- Chapter 5 List of Preparers
- Chapter 6 Bibliography and References
- Appendixes

S.2 ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION AND ALTERNATIVES

S.2.1 Summary of Scoping Process, Input, and Impact Issues

A scoping notice was published in the local media on April 4 and 5, 2002 and a scoping letter was prepared and distributed to an extensive list of agencies, organizations, and members of the public on April 10, 2002. The scoping letter list included a comprehensive group of parties who have expressed interest in the site. Appendix B presents the scoping letter, a complete list of the scoping letter recipients, and copies of response letters that were received during the 30-day scoping period.

S.2.2 Environmental Issues

The scoping letter for the Proposed Action identified the following environmental topics to be addressed in the EA:

- Land Use, Planning, Socioeconomics and Public Policy;
- Traffic and Circulation;
- Air Quality and Noise;
- Visual Quality/Aesthetics;
- Water Resources;
- Soils and Geology;
- Biological Resources;
- Cultural Resources;
- Waste Management;
- Public Facilities, Services and Utilities; and
- Energy.

The following discussions summarize the relevant input received during the scoping period that ended on May 15, 2002. The issues raised by this input are addressed in the EA.

- Visual Quality/Aesthetics: Degradation Due to the Locations and Designs of New Facilities and Associated Lighting, Especially on Top of South Table Mountain.

- Biological Resources: Threatened and Endangered Species: Preble's Meadow Jumping Mouse and Other Protected Species and Habitats.
- Land Use, Planning and Public Policy: Compatibility and Consistency with Existing Land Uses, Planning Policies, Zoning Designations, and Other Local Government Processes and Procedures, Including Open Space Conservation Easements.
- Soils and Geology: Expansive Soils and Slope Failure.
- Resource Conservation: Energy Consumption Inefficiency from Site Development Pattern – Facilities on South Table Mountain and Recycling.
- Traffic.
- Air Quality: Odor.
- Cultural Resources: Outdoor Amphitheater.
- Cumulative Impacts.

NREL has modified the Proposed Action that is the subject of this EA based on the findings of a traffic study completed in November of 2002. The study indicated that the ultimate 20-year STM site buildout, as envisioned by the Proposed Action in the Scoping letter, would cause potentially significant impacts on traffic. Because projected site conditions and surrounding traffic conditions 20 years from now are speculative, DOE and NREL decided to scale back the EA to analyze only the activities that are reasonably foreseeable over the short-term (five-year) time horizon. The revised Proposed Action is presented in Chapter 2. In summary, the revisions reduce anticipated worker levels and appropriately redefine the long-term scenario as not reasonably foreseeable at this time. Longer-term activities and potential impacts will be analyzed in future environmental documents.

The land on top of South Table Mountain is subject to various local government policies and agreements intended to limit development. Previous plans to develop these areas have met substantial public criticism, generated broad community controversy, and/or have been denied by local government. As a federal agency, DOE is generally exempt from local government regulation, but is sensitive to community concerns. It is NREL and DOE's intent to minimize its development on the mesa top, while still fulfilling its mission of research, development, and technology transfer of renewable energy and energy efficiency technologies.

NREL has developed research facilities on the mesa top while agreeing to preserve the majority of the mesa slope and mesa top land within the STM site with a conservation easement involving Jefferson County Open Space. Visual quality and aesthetic impacts from further development on the mesa top by NREL are the primary topic raised by the public during the scoping process.

The following alternatives were defined prior to the scoping period:

- New Site Alternative,
- Off-Site Improvements Alternative,
- Site Development Configuration Alternatives, and
- Reduced Development Intensity Alternative.

No additional alternatives were raised during the scoping period.

At this time, the Proposed Action and the No Action Alternative are the only alternatives addressed in the EA. The Proposed Action Alternative is to continue operation of the STM and DWOP sites for alternative energy research with new and improved capability. The No Action

Alternative would leave the site in its current configuration, add no new facilities or infrastructure, and maintain current levels of research, operation, and management.

Other alternatives raised prior to the scoping period were considered, but were eliminated from further analysis. The rationales for eliminating these alternatives follow.

- New Site and Off-Site Improvements Alternative: not considered feasible because of the technical and cost implications associated with decentralized operations and site/infrastructure complications.

- Other Site Development Configuration Alternatives: not considered feasible because of the interrelated nature of the proposed facilities, site development constraints, and the inherent flexibility of the Proposed Action with respect to future facility footprints.

- Reduced Development Intensity Alternative: not considered feasible because it is inconsistent with the Proposed Action's purpose and need and the intent of preparing this Site-Wide EA.

S.2.3 Comments on the Draft EA and Responses

A total of four comment letters (A-D) were received following circulation of the Draft EA:

A. United States Department of the Interior, Fish and Wildlife Service, Ecological Services, Colorado Field Office, LeRoy W. Carlson, Colorado Field Supervisor, March 27, 2003.

B. Southern Ute Indian Tribe, Tribal Information Services, Edna Frost, Director, February 25, 2002.

C. Jefferson County Planning and Zoning Department, Michael Smyth, AICP, Planner, April 14, 2003.

D. Sentinel and Transcript Newspapers, Golden Transcript, Sabrina Henderson, Golden Editor, Email Message March 24, 2003.

Chapter 5 of the Final EA provides a response to each substantive comment on the Draft EA. Some responses (A.2, C.29, C.31, C.32 and C.41) involved revising the text presented in the Draft EA. The other comments and responses did not require revising the text of the Draft EA. The text of this Final EA includes the entire text of the Draft EA and the appropriate revisions.

S.2.4 Description and Comparison of Environmental Consequences

The following discussion summarizes findings of this EA and compares the impacts of the Proposed Action with those of the No Action Alternative.

Implementation of the plans associated with the S&TF and the other components of the Proposed Action would not result in significant impacts to the environment because future improvements and activities included in the Proposed Action do not substantially deviate from existing conditions, and because NREL has an extensive set of existing programs, policies and practices intended to avoid, minimize and mitigate potential impacts at the STM. NREL's

environmental commitments are described in Chapter 1 and Appendix A, and mentioned, where applicable, in Chapters 3 and 4.

The direct, indirect, secondary, and cumulative impacts of the Proposed Action are discussed throughout Chapter 4. None of these impacts are considered significant, however several mitigation measures beyond existing NREL commitments are recommended. These measures primarily relate to design refinements anticipated during future processes for proposed improvements. The mitigation measures recommended in this EA include the following.

- As site development proceeds, NREL will consider site development alternatives that maintain habitat connectivity between Lena Gulch and Zone 2 (Conservation Easement) via undeveloped natural corridors.

- Construction areas and access roads should be fenced to limit disturbance to grassland habitat outside of the construction zone;

- If necessary, where water and maintenance requirements can be met, native shrub and tree species will be replaced if they are removed during construction activities.

- When future construction may impact potential habitat for migratory birds, NREL will identify any appropriate field surveys to clarify impacts and develop customized BMPs to be applied during and after construction, if necessary. An example of a customized BMP may involve delaying construction until identified nests are no longer being used for the season.

Consultation with the SHPO to develop final mitigation measures is ongoing. Consistent with Federal law (National Historic Preservation Act, Section 106 and 36 CFR 800.5 and 800.6, DOE and the State Historic Preservation Officer are negotiating MOA regarding requirements for identified cultural resources in Zone 6 (See Appendix C).

S.2.5 Comparison of Proposed Action to No Action Alternative

The vast majority of impacts created by the Proposed Action would be avoided if the No Action Alternative were selected as the preferred alternative. However, none of the impacts of the Proposed Action are considered significant, and the No Action Alternative would eliminate the beneficial impacts that could be expected from increased investment in energy efficiency and renewable energy technology and related research.

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1. INTRODUCTION

The National Renewable Energy Laboratory (NREL) is one of ten Department of Energy (DOE) national laboratories and is dedicated to the research, development, and technology transfer of renewable energy and energy efficiency technologies. The DOE Solar Energy Research Institute began operations in 1977, and achieved national laboratory status and became NREL in 1991. The Midwest Research Institute and their subcontractors, Battelle Memorial Institute and Bechtel Corporation, operate NREL for DOE. The laboratory is comprised of three main sites: 1) South Table Mountain (STM); 2) Denver West Office Park (DWOP); and 3) The National Wind Technology Center (NWTC). The STM and DWOP sites are referred to as the STM Complex and are the subjects of this environmental document. The NWTC has been reviewed under a separate NEPA process that was completed in May 2002. Additional information is available at the following Internet site: http://www.nrel.gov.

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In compliance with the National Environmental Protection Act (NEPA) (42 U.S.C. 4321) and DOE's NEPA implementing regulations (10 CFR section 1021.330), this Site-Wide EA examines the potential environmental impacts of changing site operations, a program of proposed improvements at the NREL sites, and a No Action alternative.

The 327-acre STM site is located on the southeast side of South Table Mountain, north of I-70 and west of the I-70 and Denver West Boulevard interchange in unincorporated Jefferson County, near Golden, Colorado. The STM site provides laboratory and office space and a visitor's center. The DWOP site is located east of the STM site in the vicinity of the I-70/Denver West Boulevard interchange near Golden, Colorado. DOE and NREL occupy three buildings located at the eastern end of the office complex (Buildings 15, 16, and 17) and one building (Building 27) located north of I-70 just east of the STM site. DWOP provides administrative offices and space for limited laboratory activity.

The STM Complex supports research and development needed to improve technical designs, improve power generation efficiencies, increase economic competitiveness, transfer technologies to industry, and fully characterize and minimize environmental impacts from various technologies. The Office of Energy Efficiency and Renewable Energy (EERE) research and development program focus areas include, but are not limited to:

- Solar
- Wind and Hydropower
- Geothermal
- Distributed Energy, Electrical Infrastructure and Reliability
- Biomass
- Industrial Technology
- Freedom Car and Vehicle Technology

- Hydrogen and Infrastructure
- Buildings
- Weatherizations and Intergovernmental Grants
- Federal Energy Management Program

In addition to EERE program focus areas, the STM Complex supports:

- Other DOE-Sponsored Programs.
- Work for Others Supporting the DOE Mission.

The following discussion further describes the research activities in energy efficiency and renewable energy technologies at the STM Complex:

- **Photovoltaics (PV) –** The program investigates and develops advanced solid-state materials, technologies, and systems for turning sunlight into electricity. Activities on the STM site over the next 5 years could include expanding fundamental research and development for conventional and non-conventional PV technologies; projects involving intelligent processing, in-situ diagnostics, and related areas to meet industry needs; supporting new initiatives; demonstrating more efficient PV cells and modules of various types; demonstrating potentially low-cost, high-quality, thin-layer silicon growth on a foreign substrate; demonstrating the feasibility of a e-junction device for a 38 percent-efficient solar cell under concentration; supporting the successful transition of cadmium-telluride demonstrating a monolithic, series-connected, multi-junction polycrystalline thin-film device; refining and transferring a manufacturing-friendly electro-optical-based diagnostic technique to the PV industry; demonstrating the achievement of voltage addition in an r-junction device; developing a complete capability to evaluate multi-junction concentrator cells and modules; participating in various projects to support industry in improving efficiency and lower cost of energy; and participating in projects to help industry move rapidly from laboratory-scale demonstration of new technologies to commercial manufacturing and intelligent manufacturing.
- **Biopower –** The objective of this program is to develop and expand the use of materials and technologies for combusting biomass to generate electricity and process heat. Activities on the STM site over the next five years could include testing of gasification/internal combustion systems, investigation of issues arising from integration of biomass gasification with microturbines and fuel cells, and performing life-cycle assessments relevant to biopower systems.
- **Concentrating solar power –** This program develops systems and materials for producing power from concentrated sunlight. Activities on the STM site over the next five years could include conceptual design feasibility testing for small-scale dish systems, and evaluating the feasibility of system designs for remote power applications.
- **Solar buildings –** The mission of this program is to advance the development and widespread use of competitive solar technologies for use in buildings in both domestic and international markets. Activities on the STM site over the next five years could include developing and testing field-scale prototypes of the "next generation" of solar systems for water and space heating; installing various technologies as demonstrations on the STM site; and continuing outdoor and ultra-accelerated durability testing of polymer glazings, absorbers, and coatings.
- **Hydrogen –** Activities of this program involve research and validation of technologies to enable renewable hydrogen to make the transition to a major energy carrier for electricity, heat, and transportation. Activities on the STM site over the next five years

could include using a new process development unit and the existing Thermochemical User Facility for bio-oil reforming; isolating hydrogen-producing algal mutants with enhanced oxygen tolerance; developing efficient nitride-based materials for photoelectrochemical water splitting; developing and refining technologies for storing hydrogen; operating a microbial water-gas shift pilot plant; evaluating the commercial potential of a cyclic algal hydrogen production system; performing detailed life-cycle assessments of hydrogen production systems; and developing the necessary codes and standards for the introduction of hydrogen technologies.

- **Geothermal energy –** The mission of the geothermal energy program is to work in partnership with United States (U.S.) industry to establish geothermal energy as an economically competitive contributor to the U.S. energy supply. Program activities include developing advanced heat-transfer technologies for improving the performance of geothermal power plants and direct use applications. Activities on the STM site over the next five years could include supporting testing of advanced condenser designs for use with ammonia-water working fluid and laboratory tests of innovative thermodynamic cycles that employ mixed working fluids.
- **Distributed power –** This program develops, promotes, and advances standards, codes, and technologies for integrating modular, distributed electrical generating systems into electrical grids. Activities on the STM site over the next five years could include research in system interconnection, reliability, and safety; and design and initiation of distributed power systems model development and validation through systems analysis and field-testing.
- **Superconductivity –** This program researches superconducting materials, wires, and tapes for use in highly efficient electrical transmission and storage. Activities on the STM site over the next five years could include continued development of thallium oxide superconductors suitable for application to power-related components; support of demonstration and commercial scale-up of the single-layer tellurium compounds using thick-film-processing methods such as electrodeposition and spray techniques; development of a long length biaxially textured tellurium tape; and collaboration with other NREL programs to develop a renewable oriented energy storage program.
- **Energy analysis –** NREL's Energy Analysis Office conducts technology and application, market, and benefits analyses for DOE's Office of Power Technologies and many of its individual programs. One of its primary areas of focus is on the analysis and technical support for developing green power markets nationwide. Activities on the STM site over the next five years could include continuing analysis work, and placing increased attention on emerging areas such as deregulation and distributed energy resources.
- **Biofuels –** The primary goal of this program is to develop cost-effective, environmentally friendly technologies for producing alternative transportation fuels and fuel additives from plant biomass. Activities on the STM site over the next five years could include developing updated performance data for the enzymatic conversion of corn stover to ethanol; implementing a corn stover-to-ethanol conversion demonstration (probably 50 tons/day) with an industrial partner; and reducing the cost of cellulase enzyme.
- **Fuels utilization –** This program provides technical expertise in technologies involving motor fuels, engines, emission control, and vehicle systems; studies developing a sound understanding of the environmental effects of transportation emissions; and moving these technologies into the marketplace. Activities on the STM site over the next five years could include developing advanced petroleum-based fuels and lubricants for the next generation of compression ignition engines to meet goals for operating at high efficiency and meeting future emission standards; testing advanced engine systems for

natural gas and optimizing them for heavy-duty engines; developing optimized engine management/fuel/emission control technologies; and developing a sound understanding of the relative role of gasoline and diesel vehicle exhaust to ambient levels of particulate matter, ozone, and regional haze.

- **Advanced automotive technologies –** This program develops, models, and analyzes systems for hybrid electric vehicles and fuel cells. The primary goal is to research, develop, and validate technologies that will enable domestic market introduction of advanced vehicles. Activities on the STM site over the next five years could include continuing to develop technologies and systems for hybrid electric vehicles and fuel cells; using systems analysis tools to assist industry with advanced vehicle development; developing and testing an optimized systems design for a vehicle climate control system that reduces energy use by 50%; developing a thermal comfort mannequin that simulates complex heat and mass transfer from vehicle occupants; and developing prototype, next-generation, medium- and heavy-duty natural gas vehicles that are fully comparable to diesel-powered vehicles.
- **Buildings technologies –** This program develops, promotes, and integrates energy technologies and practices to make buildings more efficient and affordable and communities more livable. These activities are supported by NREL's research in heat transfer, thermodynamics, and systems engineering. Activities on the STM site over the next five years could include exploring options for integrating emerging technologies like fuel cells into production buildings; improving the reliability of electrochromic window systems so that large-scale demonstrations can begin with industry partners; creating innovative building energy systems, including renewables, for adoption by builders; developing and demonstrating low-energy, desiccant-based dehumidification systems for hot and humid climate regions; and developing the next generation of switchable window technology.
- **Federal Energy Management Program –** The mission of this program is to promote prudent utility management within all federal facilities through energy and water efficiency and encourage the use of renewable energy. This work is facilitated by partnerships with the private sector primarily through energy service companies, utilities, and other industry associates.
- **Basic Sciences (Material, Chemical, and Biological Sciences) –** Basic sciences work involves capabilities in fundamental materials sciences, chemical sciences, and energy biosciences. NREL integrates the basic energy research with its applied research in renewable energy technologies. Over the next five years, activities on the STM site could include expanding, continuing, or demonstrating the following basic science technical areas:
  - growth, application and analysis of semiconductor materials;
  - creation and application of advanced computational tools for the development of solid state theory;
  - fabrication of advanced semiconductor devices based on improvements in device design and analysis;
  - exploration of properties and applications of new, advanced, and innovative materials such as those with nanostructured architecture (i.e., carbon nanotubes);
  - development of innovative approaches to heterogeneous and homogeneous photoconversion based on photoelectrochemical, photochemical, and photobiological phenomena;
  - application of innovative electrochemical science for developing improved fuel cells, thin-film batteries, and electrochromic devices;

- implementation of new catalyst designs with emphasis on the synthesis of electrocarrier and electrocatalyst molecules that facilitate the use of CO_2 for fuel and chemical production; and
- development of advanced models and experiments in the microbiology and biochemistry of producing renewable fuels, chemicals, and biodegradable materials.

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The No Action Alternative would leave the STM in its current configuration, add no new facilities, and maintain current levels of research, operation and management activities.

1.1 PURPOSE AND NEED FOR THE PROPOSED ACTION

The Proposed Action is to support DOE's mission in the research and development of energy efficiency and renewable energy technologies. DOE's EERE leads the national research effort to develop clean, competitive, and reliable energy technologies for the 21st century. The goal of the EERE program is to improve the Nation's overall economic strength and competitiveness, energy security, and environmental health through the development of clean, competitive, and reliable power technologies.

The purpose and need for the Proposed Action is to provide and maintain enhanced facilities and infrastructure to adequately support state-of-the-art alternative energy research. These improvements are needed to allow for growth of NREL's research programs.

1.2 SITE DESCRIPTION

1.2.1 Site Background and History

NREL's STM Complex is comprised of the STM and DWOP sites. A regional location map is presented in Figure 1-1. A local setting map showing the location of NREL facilities within the DWOP is presented in Figure 1-2. A site map for the STM facility is presented in Figure 1-3.

The 327-acre STM site is located on the southeast side of South Table Mountain, north of I-70 and west of the I-70 and Denver West Boulevard interchange in unincorporated Jefferson County, near Golden, Colorado. Only a portion of the site, 136 acres, is available for development. All existing facilities are within this 136 acres. Only 13 acres of the 136 developable acres are located on the mesa top. A total of 177 acres is protected by a conservation easement. Approximately 10 acres on the southeast corner of the STM site are designated for a future Jefferson County Open Space trail easement to provide public access to conservation easement lands. Development on the remaining 14 acres is restricted by utility

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easements. There are currently six laboratory facilities, a few small test facilities, and several support buildings on the site (see Figure 1-3). The STM site includes acreage on the South Table Mountain mesa top, slope, and toe, and was formerly part of the Colorado National Guard facility, established between 1903 and 1924, at Camp George West.

In July 1999, the southernmost 25 acres within the STM site was acquired from Jefferson County Open Space as part of a land exchange. As part of the same land exchange, DOE established a conservation easement. The conservation easement includes approximately 177 acres of land on the top and slopes of South Table Mountain. Approximately 10 acres on the southeast corner of the STM site are designated for a future Jefferson County Open Space trail easement to provide public access to conservation easement lands. This action provided the DOE with additional acreage for site development and protected the slopes and most of the mesa top area within the STM site from any future development.

The DWOP site is located east of the STM site in the vicinity of the I-70/Denver West Boulevard interchange near Golden, Colorado. DOE and NREL occupy three buildings located at the eastern end of the office complex (Buildings 15, 16, and 17) and one building (building 27) located north of I-70 just east of the STM site. DWOP provides administrative offices and space for limited laboratory activity. Limited laboratory activity is defined by a document entitled: "Risk Assessment Guide for Laboratory Backfill in Denver West Building 16." The general limitations include:

- Major work must be capable of being done on bench top.
- Chemical processes are excluded that require routine use of the local exhaust ventilation system (e.g. laboratory hood) for capturing airborne contaminants or for capturing a catastrophic release (e.g. canopy hood over process). Work requiring use of laboratory hoods shall be limited to intermittent ancillary support activities, such as sample preparation.
- Laboratory activities will be excluded from the first floor.
- Second and third floor interior laboratory space will be restricted to "dry" activities only. Activities requiring any ventilation beyond standard building ventilation are excluded.

More specific limitations and associated processes for approval of new or modified facilities are presented in the referenced document.

1.2.2 Existing Facilities

The following discussion summarizes key aspects of the sites, facilities, and operations (see Figure 1-3 for existing STM site facilities and infrastructure). .

Buildings: At the STM site, DOE owns 324,231 gross square feet (gsf) of space, the total of all interior space, including the following primary facilities.

- The largest building, built in 1985, is the recently expanded Field Test Laboratory Building (FTLB) (118,091 gsf) that is used as a multi-purpose facility with low-bay laboratories, stockroom facilities, and high-bay research areas.
- The Solar Energy Research Facility (SERF) (115,556 gsf), built in 1993, provides low-bay laboratories and associated office space.

- The Alternative Fuels User Facility (AFUF) (32,597 gsf), completed in Fiscal Year (FY) 1994, absorbed the Biotechnology Research Facility (BTRF) and contains laboratory and office space, as well as the Process Development Unit (PDU) pilot plant.
- The Outdoor Test Facility (OTF) (11,247 gsf) provides office space and indoor laboratories in support of the outdoor PV array test area adjacent to the OTF to the east.
- The Thermal Test Facility (TTF) (10,682 gsf) provides office space, an open bay test area and a roof top test area.
- The Solar Radiation Research Laboratory (SRRL)/Metrology building (2,688 gsf) was constructed in FY 2000, and provides office space, indoor laboratory space, and outdoor areas for meteorological monitoring equipment.
- The Shipping and Receiving facility (S&R) (14,207 gsf) provides space for shipping and receiving functions. The Visitor Center (6,459 gsf) provides technology displays and meeting space.
- The Site Entrance Building (814 gsf) houses around-the-clock site security, visitor greeting, "badging," and the monitoring of alarms.

NREL leases space in four buildings at DWOP, Buildings 15, 16, 17, and 27. These buildings house over 50 percent of NREL's workers, as well as DOE Golden Field Office (GO) staff. These facilities provide space for laboratory research, administration, research support activities, and government offices. The site includes 191,787 square feet (sf) of leased space. Three buildings are used for administrative activities and one building (DW Building 16) is used for research support activities as well as limited laboratory research.

1.2.3 Site Planning Process, Decision Protocol, and Environmental Management Commitments

Formal strategic and annual planning processes in effect at NREL establish work tasks and direct site development decisions in pursuit of the NREL mission. These planning and decision-making processes are integrated so that all necessary information is available for consideration, and that the information flows from one element of the planning process to another in the proper sequence. All of the planning processes and commitments described in Section 1.2.3 were considered during the development of the Proposed Action described in Chapter 2. Elements of this formal planning process interact in continuous feedback and improvement loops, and include the following:

- An *Institutional Plan* that sets forth the organization's mission, critical outcomes, and performance objectives, and identifies specific activities and resources (e.g., staff and facilities) necessary to achieve the objectives. The Institutional Plan is revised annually and includes specific environmental, safety, and health (ES&H) objectives and resource needs.
- An NREL *One-Year Plan* that translates the NREL mission defined in the Institutional Plan into specific work tasks, including research activities and site development, to be completed each fiscal year. Coordinated Annual Operating Plans (AOPs) are developed by each internal organization (e.g., technology program, science and technology center, and operations support office) in support of the *One-Year Plan*. The AOPs identify specific performance objectives, work tasks, and resource requirements for each organization for the FY.

- A *Capital Plan* having a five-year outlook that establishes resource and budget requirements for major projects (e.g., facility construction, infrastructure development, major equipment acquisitions).
- A *Site Development Plan* that captures the results of planning processes that identify, evaluate, and address opportunities and limitations of NREL's existing land and facilities. The plan's objective is to maximize the potential of NREL sites, while meeting the near-term and long-term facility and siting needs of the technology programs. A Master Site Planning process began in June 2002 and will be completed in mid-2003.
- *Site Operations Project Manager Handbook* that implements a formal design review process for all construction proposals for both new facilities and modifications to existing facilities.
- *The Design Advisory Board* that reviews specific development proposals to evaluate site development compatibility and visual quality issues, and participates in general site planning. The Board is comprised of professionals in the fields of architecture, landscape, and building design and planning, a member of the Pleasant View community, DOE representatives, and NREL staff.
- NREL *Policies and Procedures Manual* that includes NREL's ES&H Policies. The policies most directly related to the Proposed Action include the following:

  2-1 Integrated Safety Management
  6-1 Environment, Safety, and Health
  6-2 Environmental Management
  6-3 Property Protection
  6-4 Worker Safety and Health
  6-5 Occupational Medicine
  6-6 Risk Assessment

The following discussion elaborates on Policies 6-2 and 6-6 and other environmental commitments at the STM Complex.

Policy 6-2

Policy 6-2 Environmental Management sets forth NREL's environmental policy statement, general rules, responsibilities, related policies, and laboratory-level procedures. Policy 6-2 establishes NREL's general rules for environmental protection as follows:

> "NREL manages and operates this DOE site consistent with the following ongoing environmental protection goals to fulfill research objectives and to maintain good stewardship of the public land.

1. To maintain and enhance the environment on NREL's sites through restoration or other means which foster the preservation of native ecosystems.
2. To protect natural, historical, and archaeological resources.
3. To promote and preserve native ecosystems.
4. To incorporate pollution prevention practices in research and support activities.
5. To apply sustainability concepts to design and operation of facilities.
6. To continually improve the effectiveness of NREL's environmental management implementing programs.

7. To achieve a reputation in the public and regulatory community as a leader in environmental excellence through consistently high performance and open, responsive communications."

The general rules of Policy 6-2 also address "environmental hazard identification." At the STM Complex, new or substantially modified activities are evaluated in accordance with NREL Policy 6-6 Risk Assessment.

Policy 6-6

NREL Policy 6-6 Risk Assessment establishes a process that identifies hazards presented by planned research and support activities and facilities. Environmental considerations are an integral part of this process, including application of NEPA requirements. The Policy 6-6 process identifies controls necessary to maintain the risk presented by those hazards at an acceptable level. The following potential hazards are specifically referenced:

a. Emissions to air
b. Releases to surface water, including storm drains
c. Wastewater releases
d. Improper waste management
e. Contamination/releases to land
f. Impacts on communities
g. Use of raw materials and natural resources
h. Impacts to wildlife or vegetation
i. Erosion or contamination of storm water
j. Contamination of groundwater
k. Life-cycle impacts

The goals of Policy 6-6 are to address and prevent off-site impacts and proactively manage on-site activities to minimize any risks to safety, health, and the environment.

Controls identified, as necessary, during *Environmental Hazard Identification Reviews* incorporate the requirements found in numerous and specific environmental management implementing programs. These programs and NREL's permits are listed in Appendix A.

1.2.4 Other Environmental Commitments

NREL's environmental programs and policies are, in part, based on a series of regulations and recent Executive Orders (EO) on "Greening the Government." Key Executive Orders include:

- EO 13148, Leadership in Environmental Management
- EO 13101, Waste Prevention, Recycling, and Federal Acquisition
- EO 13123, Efficient Energy Management

1.2.5 Conservation Easement

The STM conservation easement provides permanent protection of the site's unique natural resources. Development is not allowed in this area. NREL manages this area to preserve the native ecosystem and maintain the health/viability of that ecosystem. Recreation in the form of hiking trails is allowed in the area; the trails are to be built and maintained by Jefferson County

Open Space. Certain existing utility corridors pass through this area. On occasion, local utilities may need to access their facilities through this easement.

1.2.6 STM Natural Resource Commitments

The following NREL commitments support conservation of the STM site's natural resources:

- The site is managed to preserve and enhance plant species and community diversity, preserve wildlife habitat, and maintain surface water quality and flow volumes;
- On-site environmental monitoring at STM is performed on an as-needed basis, and may include monitoring of off-site control areas. Although there is no routine environmental monitoring performed at STM, an occasion may arise for which monitoring of one or more environmental media is warranted, either in a localized area on-site or on a site-wide scale. This could include one or more of a variety of environmental media such as surface water, groundwater, air, soil, wildlife, or vegetation;
- Appropriate mitigation measures would be implemented for any disturbance to the conservation easement area and utility corridors. These measures would be designed on a case-by-case basis, but could include measures designed to address storm water discharge, erosion, sediment depositions, or revegetation;
- Vegetation management at STM is currently conducted on a site-wide basis with the objectives of controlling weeds, preserving species diversity, and maintaining ecosystem function to the maximum extent possible. This site-based vegetation management approach will continue, and will support the goal of preservation of plant species and communities in Conservation Management Areas. One component of the vegetation management program is integrated weed management, which incorporates a variety of weed control strategies. Techniques used at the site include such measures as: mechanical controls (e.g., mowing), cultural controls (e.g., minimizing vehicles being driven off established roadways), a variety of chemical controls (e.g., ground treatment with 4-wheel drive vehicles or backpack application), and restoration activities such as revegetation after soil disturbance. Revegetation following soil disturbance would be done using a native seed mix specifically designed for the STM site based on plants that naturally occur on the site;
- Consistent with EO 13148 (Greening the Government through Leadership in Environmental Management), NREL is implementing environmentally and economically beneficial landscaping practices whenever feasible. The principles of this type of landscaping focus on using regionally native plants for landscaping, promoting construction practices that minimize adverse effects on the natural habitat, preventing pollution, and implementing water and energy efficient practices; and
- Should any evidence of archaeological resources be discovered during construction at the STM site, NREL is committed to stopping the work in the vicinity until a qualified archaeologist can completely evaluate the significance of the find according to criteria established by the National Register.

1.2.7 Sustainable NREL

Based on the following definition of "sustainable" and NREL's Mission and Vision Statements, "Sustainable NREL" brings together NREL's commitments into a unified strategy.

> *Sustainable* \se-'sta-ne-bel\, adj. - minimal use of resources (energy, materials, water, etc.) and maximum value received from resources used, while balancing environmental, economic, and human impacts.

NREL Mission

> To develop renewable energy and energy efficiency technologies and practices, advance related science and engineering, and transfer knowledge and innovations to address the Nation's energy and environmental goals.

NREL Vision

> NREL will be the world's preeminent institution for advancing innovative renewable energy and energy efficiency technologies from concept to adoption. By partnering with our stakeholders, we will support a sustainable energy future for the Nation and the world. In achieving this next level of excellence, NREL will set the standard for others.

Sustainable NREL is:

- An initiative to help NREL become more sustainable in all its operations and a global model for sustainability.
- A management philosophy and corporate culture.
- A process of change.

In the future, Sustainable NREL envisions that NREL should be not only the preeminent laboratory in the world for research and development in all aspects of clean energy and energy efficiency, but should also demonstrate sustainable practices in all its operations.

Sustainable NREL's existing environmental stewardship commitments are in the areas of campus (master site planning); water; and energy efficiency (electricity/natural gas) through energy use reduction and new building design; transportation; materials; and greenhouse gas reduction.

The following are representative highlights of NREL's activities and accomplishments related to sustainability.

CAMPUS (Master Site Planning). NREL has undertaken the development of a 25-year General Development Planning process with a focus on sustainability.

WATER. A formal Water Conservation Management Plan was completed and two water conservation Best Management Practices (BMPs) were implemented in 100% of facilities.

ENERGY EFFICIENCY (Electricity/Natural Gas). NREL has achieved energy use reductions of some 26% as compared to the 1990 baseline. This reduction exceeds the DOE Order 430.2A requirements of reductions of 20% in 2005, and 25% in 2010. NREL will continue to annually implement additional energy use reduction measures.

ENERGY EFFICIENCY (New Building Design). The preliminary design of the new Science and Technology Facility (S&TF) was registered with the intent of securing a Leadership in Energy an Environmental Design (LEED) Gold level certification. The Laboratory space of the S&TF is

also being designed applying the principles of the Laboratories of the Twenty First Century program.

ENERGY EFFICIENCY (Peak Load Management). NREL completed installation of individual facility metering at all of its permanent facilities, including a major process load. The facility metering data will be used to further refine the operation of the energy management control systems (EMCS), and educate building occupants in order to secure future energy use reductions.

TRANSPORTATION. The Energy Policy Act (EPAct of 1992) required that 75% of new acquisitions in light duty vehicle fleets be alternative-fuel vehicles (AFVs). NREL has exceeded the EPAct 75% requirement for new vehicles acquired, with a goal of moving toward 100% AFVs or hybrids for all its nonexempt vehicles. NREL has also met federal requirements to decrease total gallons of fleet petroleum usage by 20% by 2005 as compared to 1999, and to raise fleet average rated fuel economy for non-AFV light duty vehicles.

MATERIALS. NREL met or exceeded federal requirements for purchasing products and services that are energy efficient (including EPA Energy Star labeled equipment) and/or contain recycled content recycled and/or biobased content. NREL also met or exceeded federal requirements to limit the standby power use of equipment including computers, monitors, and other peripherals. In addition, NREL actively promotes recycling of various types of materials.

ENVIRONMENTAL MANAGEMENT (Green House Gas (GHG) Reduction). As the first federal facility member of the EPA Climate Leader Partnership program, NREL has established a GHG baseline and "targeted" reductions of 10% by 2005. NREL was formally acknowledged by the EPA as one of the first charter members to have voluntarily made a reduction commitment.

The following standards, orders, and documents provide valuable guidance on energy efficiency and sustainability in building design:

- American Society of Heating, Refrigerating and Air-Conditioning Engineers' (ASHRAE's) Energy Conservation Standard 90.1 "Energy Standard for Buildings Except Low-Rise Residential Buildings;"
- DOE Draft Order 430.2X; "Departmental Energy and Utilities Management;
- Code of Federal Regulations (CFR) 10CFR435; (CFR), Part 435--Energy Conservation; Voluntary Performance Standards for New Buildings; Mandatory for Federal; Buildings;
- Whole Building Design Guide, http://www.wbdg.org;
- Roadmap for Integrating Sustainable Design into Site-Level Operations, PNNL-13183, K. L. Peterson and J.A. Dorsey; and A Design Guide for Energy-Efficient Research Laboratories, http://ateam.lbl.gov/Design-Guide/; and
- Green Building Rating System, V. 2.0, Leadership in Energy and Environmental Design (LEED), U.S. Green Building Council, http://www.usgbc.org/.

1.3 CHARACTERISTICS OF A SITE-WIDE ENVIRONMENTAL ASSESSMENT

This document is a "Site-Wide Environmental Assessment" similar to the document NREL prepared for the STM site in 1993. DOE defines a Site-Wide environmental document as follows:

> "A broad-scope Environmental Impact Statement (EIS) or EA that is *programmatic* in nature and identifies and assesses the individual and cumulative impacts of ongoing and reasonably foreseeable future actions at a DOE site." (10 CFR Part 1021)

NEPA and other environmental regulations define the term "programmatic" and the application of programmatic environmental documents. In general, a programmatic document applies to a series of related projects and where the projects should be analyzed as an overall program. This approach is proper for analyzing a series of projects that are related either:

1. Geographically;
2. As logical parts in a chain of contemplated actions;
3. In connection with the issuance of rules, regulations, plans or other general criteria to govern the conduct of a continuing program; or
4. As individual activities carried out under the same authorizing statutory or regulatory authority and have generally similar environmental effects that can be mitigated in similar ways.

The Proposed Action, as described in Chapter 2, is composed of improvements that are related geographically and are part of a series of interconnected actions to be implemented by NREL.

This Site-Wide EA provides an analytical superstructure for subsequent, more detailed analyses, as necessary. The document will serve as a planning tool that aids decisions about future development of the site. As details are developed in the future, NREL will conduct subsequent environmental reviews that would incorporate the analyses from this programmatic document. Future reviews would be focused only on those issues that have not been adequately addressed.

In addition to the NEPA reviews, DOE requires that Site-Wide NEPA documents be evaluated periodically by means of a "Supplemental Analysis." The Supplemental Analysis determines whether the Site-Wide EA remains adequate or a new Site-Wide NEPA document is required. NREL is scheduled to prepare the next Supplemental Analysis in 2008.

1.4 ORGANIZATION, CONTENT, AND OBJECTIVES OF THIS ENVIRONMENTAL ASSESSMENT

This EA is organized in a manner consistent with NEPA and DOE's NEPA implementation guidelines, including the specific guidelines for Site-Wide EAs. The EA has seven sections. The first section is a Summary. The organization, content, and objectives of the EA's remaining chapters are as follows:

Chapter 1 Introduction presents the purpose and need for the program, describes the site, characterizes the purposes and objectives of a Site-Wide EA, summarizes the organization, content, and objectives of this EA, sets forth future NEPA documentation protocol and checklists, and summarizes the scoping process and results.

Chapter 2 Proposed Action and Alternatives presents a detailed description of the short-term and long-term program of improvements on the site and describes the No Action Alternative.

Chapter 3 Affected Environment describes environmental baseline information about the site and surrounding area.

Chapter 4 Environmental Consequences and Mitigation Measures describes potential impacts of the Proposed Action and No Action alternatives, compares the impacts, presents required and recommended measures to reduce impacts, and makes "significance" findings.

Chapter 5 List of Preparers identifies the individuals who prepared the EA and their roles.

Chapter 6 Bibliography and References presents a listing of key documents used in the preparation of this EA and consultations that took place as part of the EA process.

1.5 SCOPING PROCESS AND RESULTS

A scoping notice was published in the local newspapers on April 4 and 5, 2002, and a scoping letter was prepared and distributed to an extensive list of agencies, organizations, and members of the public on April 10, 2002. Appendix B presents the scoping letter, a complete list of the scoping letter recipients, and a complete list of response letters that were received during the 30-day scoping period.

1.5.1 Environmental Issues

The scoping letter for the Proposed Action identified the following environmental topics to be addressed in the EA:

- Land Use, Planning, Socioeconomics, and Public Policy;
- Traffic and Circulation;
- Air Quality and Noise;
- Visual Quality/Aesthetics;
- Water Resources;
- Soils and Geology;
- Biological Resources;
- Cultural Resources;
- Waste Management;
- Public Facilities, Services and Utilities; and
- Energy.

The following discussions summarize the relevant input received during the scoping period that ended on May 15, 2002. The issues raised by this input are addressed in the EA:

- Visual Quality/Aesthetics: degradation due to the locations and designs of new facilities and associated lighting, especially on top of South Table Mountain;
- Biological Resources: threatened and endangered species: Preble's Meadow Jumping Mouse (PMJM) and other protected species and habitats;
- Land Use, Planning and Public Policy: compatibility and consistency with existing land uses, planning policies, zoning designations, and other local government processes and procedures, including open space conservation easements;
- Soils and Geology: expansive soils and slope failure
- Resource Conservation: energy consumption inefficiency from site development pattern – facilities on South Table Mountain and recycling;
- Traffic;

- Air Quality: odor;
- Cultural Resources: outdoor amphitheater; and
- Cumulative Impacts.

NREL has modified the Proposed Action that is the subject of this EA based on the findings of a traffic study completed in November of 2002. The study indicated that the ultimate 20-year STM site buildout, as envisioned by the Proposed Action in the Scoping letter, would cause potentially significant impacts on traffic. Because projected site conditions and surrounding traffic conditions 20 years from now are speculative, DOE and NREL decided to scale back the EA to analyze only the activities that are reasonably foreseeable over the short-term (five-year) time horizon. The revised Proposed Action is presented in Chapter 2. In summary, the revisions reduce anticipated worker levels and appropriately redefine the long-term scenario as not reasonably foreseeable at this time. Longer-term activities and potential impacts will be analyzed in future environmental documents.

The land on top of South Table Mountain is subject to various local government policies and agreements intended to limit development. Previous plans to develop these areas have met substantial public criticism, generated broad community controversy and/or have been denied by local government. As a federal agency, DOE is generally exempt from local government regulation, but is sensitive to community concerns. It is NREL's and DOE's intent to minimize development on the mesa top, while still fulfilling its mission of research, development, and technology transfer of renewable energy and energy efficiency technologies.

NREL has developed research facilities on the mesa top while agreeing to preserve the majority of the mesa slope and mesa top land within the STM site with a conservation easement involving Jefferson County Open Space. Visual quality and aesthetic impacts from further development on the mesa top by NREL were the primary topics raised by the public during the scoping process.

1.5.2 Alternatives

The following alternatives were defined prior to the scoping period:

- Proposed Action;
- No Action Alternative;
- Site Development Configuration Alternatives;
- Reduced Development Intensity Alternative.

No additional alternatives were raised during the scoping period.

At this time, the Proposed Action and the No Action Alternative are the only alternatives addressed in the EA. The Proposed Action alternative is to continue operation of the STM Complex for alternative energy research with new and improved capability. The No Action Alternative would leave the site in its current configuration, add no new facilities or infrastructure, and maintain current levels of research, operation, and management.

Other alternatives raised prior to the scoping period were considered, but were eliminated from further analysis. The rationales for eliminating these alternatives follow.

- New Site and Off-Site Improvements Alternative: not considered feasible because of the technical and cost implications associated with decentralized operations and site/infrastructure complications.
- Other Site Development Configuration Alternatives: not considered feasible because of the interrelated nature of the proposed facilities, site development constraints, and the inherent flexibility of the Proposed Action with respect to future facility footprints.
- Reduced Development Intensity Alternative: not considered feasible because it is inconsistent with the Proposed Action's purpose and need and the intent of preparing this Site-Wide EA.

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2. PROPOSED ACTION AND ALTERNATIVES

This Chapter of the Site-Wide EA describes the Proposed Action and No Action Alternatives. Other alternatives were considered prior to and during the scoping period. Those alternatives and the rationales for eliminating them from further consideration in this EA are described in Chapter 1.

2.1 PROPOSED ACTION

The Proposed Action is to operate the STM complex for alternative energy research and development with new and improved capability to support DOE's mission to research, develop and transfer to industry renewable energy and energy efficiency technologies. The Proposed Action consists of new activities and new and modified facilities. Construction would include permanent physical improvements to the site that involve buildings and equipment, utilities, and other infrastructure. Implementation of the Proposed Action is expected to occur between 2003 and 2008.

The actual components and implementation schedule for the site improvements are dependent on federal budgeting decisions and fluctuating priorities. Therefore, the Proposed Action is described in general rather than specific terms, and only some portion of the Proposed Action components would be expected to be in place prior to or by 2008. At this time, there is no certainty over which of the many Proposed Action components would be funded and then implemented, with one exception. This exception is the proposed S&TF. The preliminary design and location of the S&TF are known and described in Section 2.1.2. The designs and locations of other proposed facilities are uncertain, so various options are possible. Consequently, specific details are subject to modification and the analyses in this EA allow for future flexibility.

This EA fully addresses the potential impacts of the proposed S&TF and employs a "bounding analysis" approach for the other proposed improvements based on a conceptually defined site "buildout" scenario. A bounding analysis uses simplifying assumptions and analytical methods that are certain to overestimate actual environmental impacts. In this case, the "menu" of components that defines the Proposed Action represents projects that may or may not be in place by 2008. The defined buildout scenario for the STM Complex in 2008 is described later in this Chapter.

The defined buildout scenario may never occur or it could change to involve less development. All of the possible improvements described in the following sections will not be in place by 2008; only some components out of the entire list of possibilities will actually be implemented. Federal funding decisions and changing program priorities primarily control the level of site development as well as which facilities and programs go forward by 2008. The purpose of defining various possible components of the 2008 buildout scenario in this EA is to allow for comprehensive assessment of potential impacts from the realm of possible future site activities. This will provide an analysis within the expected limits of future site use and development.

2.1.1 Site Development Zones

As shown in Figure 2.1, NREL has established seven zones on the STM site. The future development to be allowed in these zones is summarized as follows.

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Zone 1: Top of Mesa, Buildable Area (13 acres) – This zone includes land for specialized research such as solar collection and solar radiation. Additional facilities, if any, are to be of minimal size, low occupancy, and designed for minimal disruption to views of the mesa.

Zone 2: Conservation Area (177 acres) – This zone includes approximately 87.5% of the mesa top area within the STM site boundary and all of the mesa slopes on the site. Land within Zone 2 provides broad vistas of the surrounding community and is highly visible from numerous vantage points. Zone 2 would be preserved in its natural form; no development is allowed in this area with the exception of hiking trails and associated signage and maintenance activities.

Zone 3: West Campus (20 acres) – Includes the OTF, TTF, AFUF, S&R, Maintenance, Bulk Storage, and West Entrance. Buildings in this zone are smaller than those in Zone 4, largely due to space limitations. This zone is primarily for general research and development and process pilot facilities. It may also include functions such as wet chemistry, transportation research, and biological sciences. This portion of the site is considered suitable for using hazardous materials. Hazardous materials are discussed in Sections 3.10 and 4.10. The pattern of development for this zone is to continue development with density increased by in filling between existing facilities.

Zone 4: Central Campus (55 acres) – This zone includes major buildings such as SERF, FTLB, and the future S&TF. It also includes wet laboratories and space for heavy research such as experiments with hydrogen, toxic gases, PV, biofuels, and industrial technology. This portion of the site is considered suitable for the use of potentially hazardous materials and process demonstration activities. This zone is considered the center of the campus.

Zone 5: East Campus (26 acres) – This zone includes the Visitor Center and East Entrance, and is presently otherwise undeveloped. The zone is designated to be for general research and development with dry laboratories and minimal use of hazardous materials. It is also a zone where research support facilities could be located.

Zone 6: Camp George West Parcel (25 acres) – This is an undeveloped area of the site, bordered on the east and west by residential properties and on the south by a future regional park. This zone is designated to be for general research and development with minimal use of hazardous materials. It is also a zone where research support facilities could be located.

Zone 7: Historic Resources (11 acres) – Zone 7 has two parts. Both parts include areas previously developed as part of Camp George West and include protected cultural resources. The amphitheater and associated footbridge are in the larger part of Zone 7. The ammunition igloo is located in the smaller part of Zone 7. NREL plans no new improvements in this zone.

2.1.2 Science and Technology Facility

The S&TF is at the completion of the preliminary design stage. This means considerable detail is available for this component of the Proposed Action, but the details of the design remain subject to change as the process proceeds. The site planning and design proposals presented for this component of the Proposed Action are based on the S&TF Title I Preliminary Design Report (100% submittal).

The proposed S&TF facility would be located in Zone 4 (see Figure 2-1). Figure 2-2 clarifies the site location and a future expansion site for another facility in the future. The future expansion of the S&TF, or other specific improvements in this location, is not being analyzed in this EA. No design work has been done for such an improvement and no funding is available or set aside for such an improvement. For these reasons, future S&TF expansion(s) in this location is not considered reasonably foreseeable at this time. The proposed hardscape/ landscape plan for the S&TF is presented in Figure 2-3. The Preliminary Site Grading and Drainage Plan is presented in Figure 2-4.

The following discussion is based on the preliminary design report and summarizes the key features of the proposed S&TF.

- **Location, Purpose and Overall Description:** The proposed S&TF would be located at the STM site in Zone 4. The location is in compliance with the current campus development plan, and the design respects the siting concepts developed for the adjacent SERF.

  The S&TF would provide for PV research and office space, and expand activities currently conducted in the SERF. The S&TF would accommodate expected growth in both fundamental and process PV research. More specifically, research activities planned for the S&TF would include thin-film deposition/process, electro-optical diagnostic development, user thin film characterization, machine shop activities, surface analysis and analytical microscopy, degreasing and cleaning, interconnect process development, wet chemistry and electrodeposition, contact process development, and process development and integration.

  The proposed three-level building would provide approximately 70,000 to 75,000 sf of space and would be tucked into the existing slope so that the first and second level of the S&TF would align with the SERF. A total of 55 offices spaces are included. A pedestrian connection at each of the two laboratory levels and a service connection aligned with the second level service corridor at the SERF would promote interaction between the two facilities. Exterior building design features and materials would be similar to and compatible with those of the adjacent SERF and the surrounding site.

  The western edge of the general site location is defined by an existing 78-foot-wide utility easement east of the SERF. The existing service road would be extended in an east/northeast direction providing service access to the new facility. In addition, an emergency access drive is planned on the south side of the S&TF to provide the required fire equipment accessibility. The emergency access drive would most likely have an unpaved, all-weather surface. The service drive at the north edge of the research buildings is being implemented incrementally with each building project, and

FIGURE 2-2 PROPOSED SITE FOR THE PROPOSED SCIENCE AND TECHNOLOGY FACILITY

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INSERT FIGURE 2-3 HARDSCAPE/LANDSCAPE PLAN FOR THE SCIENCE AND TECHNOLOGY FACILITY

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INSERT FIGURE 2-4 SITE GRADING & DRAINAGE PLAN FOR THE SCIENCE AND TECHNOLOGY FACILITY

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would eventually form a complete loop. The south edge of the site would approximately align with the office pods of the SERF.

The proposed site for the S&TF is a disturbed site that exhibits past dumping of construction debris and the deposit of excavated soil. The building would occupy the disturbed site, and the site would be returned to the natural grades to the extent possible by removal of excess soil and construction debris. At the conclusion of construction, the disturbed area of the site would be reseeded with native grasses and other native and drought-tolerant vegetation.

The construction period is expected to be approximately 21 months. Exterior construction would be complete in approximately 10 to 11 months. Construction activities are expected to occur during daylight hours only.

- **Building Layout:** The conceptual building organization reflects the desire to provide daylight and views for the laboratory, circulation corridors and office space of the S&TF. Safety for building occupants is of primary importance. The S&TF is horizontally zoned similar to the SERF in that people access to the laboratories is separated from the movement of chemicals and equipment. A dedicated service corridor at each laboratory level, which is linked to the S&R dock, provides space for transportation of hazardous materials and laboratory support equipment. The vertical zoning of the three-level building places office and laboratory program components at the first level, laboratory and service functions at the second level, and a mechanical equipment penthouse at the third level. Laboratory components that have vibration sensitivity, such as the Process Development Integration Laboratory (PDIL), are placed on grade to minimize site and building-generated vibration. The vertical zoning of the three-level building allows for daylight and views into all occupied components of the building. The laboratory modules on the first level opposite the office component are light sensitive, and daylight would be incorporated only into the circulation corridor.

  The first level of the S&TF contains the public lobby, laboratory space and adjacent single level office and support space. The office component has exposure on three sides of the office to views and daylight. The second level contains the laboratory components that have a direct relationship to the PDIL. The second level service corridor would be extended west to the SERF as an elevated conditioned bridge spanning the utility easement. Both the first and second levels have been organized to provide an opportunity for future growth to the northeast. The third level is the mechanical equipment penthouse, which contains both air handling and exhaust.

- **Parking:** The existing on-site parking that was constructed as part of the SERF project would be utilized for parking for the S&TF. A vehicular turnaround would be constructed at the northeast corner of the existing parking access drive and a new pedestrian sidewalk would provide access to the S&TF.

- **Grading, Erosion Control and Drainage:** Some cuts and slope grading will be required. Grading for this project would be blended into existing grades as much as possible. It is important that the grades be feathered in to make it look more natural. All disturbed areas would require seeding and erosion control mats. Soil roughening and contouring would also help reduce runoff. Sediment control devices would be specified

at discharge points to accumulate sediment and prevent migration downstream. The project shall conform to the EPA NPDES discharge permit requirements.

The storm drainage would consist of roof drains from the building, as well as surface drainage at the dock area and around the building. The roof drains and overflow roof drains would connect within the building and tie into the surface drainage outside of the building. Storm water would then be routed to either an existing storm drain below grade that discharges into an on-site storm water detention basin, or routed through landscaped areas to the existing storm water detention basin.

Additional measures to slow runoff flow and reduce the likelihood of downstream flooding would be developed and implemented as feasible. An example would be routing runoff flows through landscaped beds before discharge.

- **Central Plant / Heating and Cooling:** The SERF currently has a central heating and chilled water plant that was designated for expansion. An annex to the existing central plant would expand the central plant. The existing boiler room would be expanded to accommodate a new boiler sized for the heating load of the S&TF. The existing chilled water system would be expanded by adding a new chiller room with equipment sized to meet the chilled water load of the S&TF with connections made into the existing primary and secondary chilled water supply and return headers.

  The heating water system for the SERF is also a primary/secondary piping system. The new boiler, sized to handle the S&TF heating load, would be installed and piped in parallel with the existing boilers. A new secondary heating loop with primary and standby pumps would extend from the SERF central plant to the heating coils in the S&TF. The heating water piping would be extended to the S&TF via a pipe bridge and would be routed through the S&TF in the service corridor up to the penthouse mechanical room and the office pod mechanical room. The central plant expansion is discussed further in Section 2.1.3. under the SERF Energy Center Expansion.

- **Water / Wastewater / Fire Protection:** The S&TF would have two separate waste systems, a sanitary waste and a laboratory waste. The toilet rooms, janitor closet, mechanical equipment rooms, and break room would connect to the cast iron sanitary waste. The laboratory waste line would connect to all sinks, floor drains, and service trenches in the laboratory, process areas and service corridors. With the "Zero Discharge" policy in place at NREL, acid resistant piping would not be required for the laboratory waste lines. A sampling station for all laboratory waste would be installed on the laboratory waste line before it exits the building and ties into the sanitary line. Floor drains in all laboratories would be equipped with a normally closed plug or cap. The sanitary line would connect to the existing main in Denver West Boulevard.

  The existing 12 inch (300 mm) water main is a combination domestic water and fire main, and is located to the east of the SERF. This line would be modified to extend east along the south side of the S&TF, around the new S&TF, and re-connect to the SERF main water line north of the existing building. Since the water main is considered the property of the water purveyor, Consolidated Mutual Water Company, they would perform all of the design and construction associated with the water main. A new water meter would be located outside of the S&TF mechanical equipment room to serve the building. Copper pipes would deliver the domestic water to toilet rooms, janitor closets,

laboratory sinks, and safety showers. Domestic hot water would be delivered to end users through a re-circulating piping system.

The fire protection system would consist of an automatic sprinkler system installed throughout the S&TF. The dock area would be provided with a dry pipe system. All other areas would have a wet pipe system installed. Electrically supervised shut-off valves would be located in strategic areas to permit the isolation of problem areas without disabling the entire fire protection system of the building. The system would be designed per the requirements of National Fire Protection Association (NFPA) 13 for an Ordinary Hazard, Group 2 area. The estimated system demand is 300 gallons per minute (gpm) at 60 pounds per square inch gauge (psig) residual water pressure. Based on the estimated residual pressure, a fire pump would not be required. NREL would perform water pressure tests and verify the static and residual pressures.

- **Compressed Air System:** The existing compressed air system located in the central plant of the SERF would be expanded to accommodate the needs of the new S&TF. Currently a 50-horsepower compressor and dryer/filter system provide laboratory quality air to the SERF. Two smaller compressors act as back-up units to this system. Based on the age and capacity of the back-up compressors, these units would be replaced and a larger compressed air system would be connected in parallel to the existing laboratory compressed air loop.

  The type of work being done in the S&TF does not require the use of house vacuum. Based on this information, a central vacuum system would not be installed for the building. Vacuum requirements would be satisfied with individual vacuum pumps located in the service corridor. The individual vacuum pumps would be provided on an as-needed basis by NREL.

- **Laboratory Gases / Fuels:** The S&TF would have a dedicated nitrogen system. A large liquid nitrogen storage tank would be located outside of the building, and 120 psig nitrogen gas would be supplied to all laboratory process areas through a piping system located in the service corridors.

  A dedicated hydrogen gas system would serve the new building. Hydrogen storage tanks would be located outside of the building, and 150 psig hydrogen gas would be piped into the laboratory/process areas through the service corridor. Excess flow valves and detection systems would be designed to shut off the supply of hydrogen gas in an emergency. The detection system would be connected to the existing building management system.

  Many of the processes that would be performed in the new facility require the use of Silane. A dedicated Silane storage area would be located on the north side of the building and Silane would be supplied to three Laboratories through a piping system located in the service corridors. Piping inside the building would be routed through a continuously ventilated piping raceway to the point-of-use.

  The processes that would be performed in the new facility also require several types of specialty gases. To accommodate the variety of different gases, a dedicated gas storage room (Toxic Gas Room) would have cabinets to house gas cylinders. This would include toxic, highly toxic and corrosive gases. Stainless steel tubing through the

service corridors would deliver the gas to the end user via a continuously ventilated piping raceway system.

A toxic gas monitoring system would be installed in the S&TF, and would be based on the type and criteria used for the SERF system. Toxic gas monitoring shall consist of a minimum of two points in Laboratories 101, 109, and 110, the Toxic Gas Room, and the Silane storage area.

A new de-ionized water system would be installed with new supply lines to serve the S&TF. The de-ionized water system would be continuously recirculated.

The S&TF would have a dedicated argon system. A liquid argon storage cylinder would be located outside of the building, and argon gas would be distributed to process areas through a piping system located in the service corridors.

- **Electrical / Power Systems:** The grounding system is designed to provide a condition of zero potential throughout the facility. It would incorporate all the elements required by code (bonds to steel, water, etc.), as well as those required for the high-frequency support of electronic systems. The latter would include dedicated busses regularly located in all laboratory spaces. Lightning protection would be an adjunct to the grounding system, and would consist of a single Early Streamer Emission (ESE) mast equal to that used on SERF. The ESE would be tied into the overall ground grid via electrodes placed at two roughly opposite points.

  Branch circuit, telephone and data distribution within the laboratories would be handled in several ways, including but not limited to, surface wiremold, conduit to individual receptacles, cable trays, cord reels, and direct connection via junction boxes.

  Internal lighting for most of the S&TF would be accomplished by blending natural and artificial sources. Control systems to make this blending as efficient as possible would include ambient and external light sensing. These would be coupled with occupancy sensors, timers, and override switches to ensure that no room goes dark while occupied. Emergency lighting fixtures would be turned off under normal conditions, and through relays, would come on when utility power is lost in any area. A limited amount of accent lighting would be incorporated in public spaces and conference rooms. Explosion-proof fixtures would be used where hazardous chemicals are stored. External lighting would be provided primarily by ground-mounted PV bollards matching those at SERF.

  A single diesel-fueled engine generator would provide standby power for egress and night lighting in the entire S&TF and ventilation in the laboratories. Enough fuel would be stored in the skid tank to run the generator at least 24 hours at full load.

- **Communications:** Communications in the S&TF would be comprised of telephone, data and paging systems. Design of the telephone and data equipment and cabling would be completed during final building design.

2.1.3 Additional Proposed Action Components

The additional Proposed Action components are organized into the following categories:

- Construction of New and Modification of Existing Facilities and Research Areas
- Infrastructure Modifications and Improvements
- Operation and Maintenance of New and Modified Facilities

The following Proposed Action components are under consideration in each category.

Construction of New and Modification of Existing Facilities and Research Areas:

- New laboratories for plant biotechnology and research greenhouses
- Biorefinery pilot-scale facility
- Microbial water/gas shift pilot plant
- Facilities for whole building testing, integrated building/transportation energy systems, and consolidating staff and laboratory space
- Facility for large vehicle test research
- Laboratory facilities for expanded fundamental hydrogen research
- New facility for larger scale hydrogen process development and integration
- Additional space for computing facility and increased connectivity
- Visitor Center expansion
- Research support facilities
- Modification of other existing facilities
- Expansion of Solar Radiation Research Laboratory (SRRL)
- Expansion of the FTLB
- Zero Energy Building
- Small scale wind turbine research and development

Infrastructure Modifications and Improvements:

- SERF Energy Center Expansion
- Additional alternative fueling stations
- Upgrade the existing electrical infrastructure
- Upgrade and extend telecommunications infrastructure
- Upgrade existing domestic water system
- Upgrade fire protection system
- Upgrade sewage system
- Upgrade and modify on-site roads, parking areas, and site entrances
- Visitor Center parking expansion
- Security structures and equipment
- Gray water system

Operation and Maintenance of New and Modified Facilities:

- Office work
- Onsite environmental monitoring
- Site amenities
- Fuel storage and use
- Routine tasks

Future facility construction and improvements to existing facilities would incorporate various sustainable design features.

The following discussions elaborate on the Proposed Action components.

Construction of New and Modification of Existing Facilities and Research Areas:

- **New laboratories for plant biotechnology and research greenhouses –** These laboratories would provide for expanded fundamental bioscience research. Research would be in areas such as plant biotechnology, kinetics for processes, process modeling, integrated process development, sensor and control systems, and gas clean-up capabilities for biopower plants.
- **Biorefinery pilot-scale facility –** This facility would provide for integrated process development and testing. Research at the facility would support the development of a biorefinery capability that produces fuels and chemicals using biological and/or thermal conversion processes.
- **Microbial water/gas shift pilot plant –** This (20,000 sf) facility would provide for pilot-scale process development and testing of biologically mediated processes to treat synthesis gas streams (principally containing carbon monoxide and hydrogen) to produce additional hydrogen and other biodegradable and environmentally friendly chemicals. The facility would include standard pilot-scale chemical process control and analysis capabilities, a small-scale gasifier for the on-site generation of synthesis gas, and pilot-scale biological reactors for production of microbial cultures including conventional and photosynthetic bacterial cultures.
- **Facilities for whole building testing, integrated building/transportation energy systems, and consolidating staff and laboratory space –** These improvements would allow for continuing research on heating, ventilation, and air conditioning (HVAC) technologies, lighting, windows, the building envelope, and appliances. There would be more research and development emphasis on cooling loads; natural gas; fuel cells and micro co-generation for combined heating, cooling, and power. Materials research would also be conducted for polymers, reflective materials, electrochromic coatings, as well as other areas. Testing and validation for emerging building technologies would also be important.
- **Facility for large vehicle test research –** This improvement would provide space for advanced vehicle prototyping and computer modeling and vehicle total environmental testing.
- **Laboratory facilities for expanded fundamental hydrogen research; new facility for larger scale hydrogen process development and integration –** These improvements would provide space for expanded hydrogen research and development. The types of work that may be done could include photo biological conversion, which uses molecular biology to modify algae and bacteria to produce hydrogen from water; photo electrochemical conversion, which uses PV cells to directly split water; and thermo chemical conversion, which uses pyrolysis and gasification to produce hydrogen and other gases from biomass. Process development and testing would be done at all stages of research processes. Systems engineering to integrate hydrogen with fuel cells and other technologies may be conducted, as well as developing storage technologies for transportation applications and developing refueling systems. The process development facility could be planned with blast walls for higher-pressure hydrogen experiments. Additional environmental review would be conducted prior to construction of a pilot-scale hydrogen facility.
- **Additional space for computing facility and increased connectivity –** NREL would increase its connectivity to access supercomputing capabilities at other laboratories. NREL would also improve its high-performance computing capability with space for high-

end workstations, a modest supercomputer, and disk and tape libraries. This capability would ideally be centrally located in either a new computing facility or modified to space in an existing facility on the STM site.

- **Visitor's Center expansion –** The existing facility would remain and be expanded to the north and/or west up to double its present size. The expanded Visitor's Center would contain exhibits and demonstrations for visitors related to renewable energy and energy efficiency; sustainability in building design, landscaping, or resource use; and other similar topics.
- **Research support facilities –** One or more facilities for research support activities would be constructed for activities such as computing and modeling, analysis, planning, graphics, reproduction, management, administration, library services, and information technology.
- **Modification of existing facilities –** Various internal and external modifications of existing facilities would be part of future improvements.
- **Expansion of the SRRL –** The existing mesa top building would be expanded to provide office space for all six team members, a small conference area, and additional laboratory space. Old office space would then be converted to new laboratory space. The new addition is anticipated to provide approximately one-half the square footage of the current building. The expanded SRRL is expected to provide just over 4,000 sf of total net area. The final area and dimensions would be determined during building design.
- **Expansion of the FTLB –** Additional office and laboratory space would be added to the FTLB. Areas to support offices and laboratories would also be constructed, such as fan lofts. The expansion could involve construction of office areas on the front (south side) of the building, laboratories at the southeast corner, laboratories and offices on the north side on a mezzanine over the existing Central Plant (utility) area and the recently constructed office area, or laboratories and support space on the west side.
- **Zero Energy Building –** A sustainable demonstration building that incorporates a variety of renewable energy features would be constructed on the STM site. A demonstration building that showcases sustainable renewable energy technology may be built as an educational facility, visitor residence, or other type of facility.
- **Small Scale Wind Turbine Research and Development –** Although NREL's primary site for wind turbine testing is the National Wind Technology Center, it is sometimes desirable to install a small wind turbine at the STM site. Turbine testing would be done at the STM site if it is needed to further NREL's mission objectives related to the site or its programs, more efficient in terms of location of staff, or more cost-effective because of existing instrumentation. Such a turbine may be a stand-alone turbine or part of a hybrid system (two or more technologies combined, for example a renewable technology and fossil fuel). One turbine, a Whisper H40 model, has been subject to previous NEPA review and installation is expected within a few months. Installation of a second turbine is possible in the future. Wind turbine testing at the STM site would meet the following criteria:
    - Turbine tower height would not exceed 40 feet (13 meters) above the ground;
    - No more than two turbines would be installed or tested at a time;
    - The power rating of each turbine would not exceed 1000 watts.

Infrastructure Modifications and Improvements:

- **SERF Energy Center Expansion –** An expansion of the SERF Energy Center would be constructed on the east side of the existing SERF building. The Energy Center

Expansion would provide space for a new chiller for the SERF, expected to be about 400 tons capacity. The expansion would also be sized to accommodate the new chiller and boiler needed for the proposed S&TF. Although design of the proposed Energy Center Expansion has not yet been completed, the dimensions of the expansion are expected to be approximately 30 feet by 30 feet.

- **Additional alternative fueling stations –** NREL's sustainable management philosophy affects decisions about all aspects of the NREL operations, including vehicle fleet choices that move the NREL toward 100% alternative-fueled vehicles. As more alternative fueled vehicles become available, NREL may install additional alternative fueling stations for various types of viable alternative fuels. These may include (but are not limited to) electric, natural gas, methanol, ethanol, or new diesel blends, including biodiesels.
- **Upgrade the existing electrical and natural gas infrastructure –** Xcel Energy provides electrical and natural gas service to the STM site. Both services are expected to be adequate for NREL's future needs; however, if circumstances change, replacement or upgrade to existing facilities may be necessary.
- **On-site power generation using renewable energy sources –** NREL would consider using renewable energy sources on the STM site to demonstrate its technologies and to provide some energy for on-site power needs in order to further NREL's goals to become a more sustainable facility. On-site generation would be on a small scale, with the primary purpose of demonstrating NREL-developed technologies and providing for on-site power needs.
- **Upgrade and extend telecommunications infrastructure –** Qwest Communications provides telephone and electronic communications to the STM site. Two five-inch conduits are routed along Denver West Parkway to the west end of the site for future upgrades to these systems (see Figure 1-3). While the infrastructure is considered adequate for current needs, it is anticipated that as development progresses at the site, the connectivity capacity would need to be increased to support NREL access to high-performance computing capabilities at other laboratories. The capacity of these systems would also have to be increased, as required, to meet growing needs. Improvements are planned in the DWOP area and Qwest may extend the duct bank into the STM site in the future.
- **Upgrade domestic water system –** As new facilities are added to the STM site, new connections to the water system would be added. Although the current water system is anticipated to be adequate for the foreseeable future, if circumstances change, modifications and/or upgrades may be necessary.
- **Upgrade sewage system –** The existing on-site sewer system capacity is considered adequate for current buildings, the S&TF and a bioenergy research facility, or other facilities with similar wastewater requirements. New development associated with the Proposed Action would not require modifications to the overall sewer system infrastructure. Minor changes would be expected to allow for new connections.
- **Upgrade fire protection system –** As new facilities are added, they would be equipped with adequate fire protection systems according to appropriate industry and DOE standards.
- **Upgrade and modify on-site roads, parking areas, and site entrance –** On-site roads and parking areas would be resurfaced, upgraded, or modified in size or location, as necessary, to most effectively and safely support on-site activities. Access roads to new facilities and test sites would be installed.

- **Visitor Center parking lot –** The Visitor Center parking lot would be expanded to the north. The drainage north of the current parking area would either be routed beneath the new parking area or re-routed around the new parking lot.
- **Security structures and equipment –** Modifications and upgrades to security measures would be implemented in accordance with federal security mandates and site needs. These could include changes or additions to the site entrance building, gates, fences, alarms and surveillance systems, access control systems, or other security equipment and facilities. It might also include fencing of the entire NREL site, with the exception of the conservation easement land.
- **Gray water system –** As development of the STM site progresses, NREL would consider various options to enhance the efficient use of water; for example, collection and storage of rainwater, or treatment and reuse of process wastewater for such uses as irrigation of building landscaping.

Operation and Maintenance of New and Modified Facilities:

- **Office work –** Work in NREL's offices would involve computer workstations, printers, copiers, FAX machines, and other typical office equipment and supplies.
- **On-site environmental monitoring –** Environmental monitoring on the STM site would be performed on an as-needed basis and could include monitoring of off-site control areas. Although there is no routine environmental monitoring performed on the STM site, an occasion may arise for which monitoring of one or more environmental media is warranted, either in a localized area on site or on a site-wide scale. This could include one or more of a variety of environmental media, for example, surface water, groundwater, air, soil, wildlife, or vegetation.
- **Site amenities –** Site amenities would consist of improvements such as foot and bicycle trails, sidewalks, and outdoor gathering places. These outdoor areas may include benches, tables, gazebos, or small recreation areas.
- **Fuel storage and use –** On-site fuel storage and use could involve a variety of traditional and/or alternative fuels, such as propane, hydrogen, liquefied natural gas, ethanol, gasoline, diesel, biodiesel, and other diesel blends for research, site operations, and vehicle fueling.
- **Routine tasks –** This category of activities is comprised of tasks such as:
  - Cleaning both research and site operations facilities and equipment;
  - Inspections and audits of systems, processes, and equipment;
  - Equipment storage and maintenance;
  - Landscape maintenance (e.g., mowing, trimming, weeding, replacement of plants, upgrades, etc.);
  - System testing, preventive maintenance, repairs of systems and components;
  - Snowplowing;
  - Road maintenance;
  - Re-alignment of on-site roads, parking lots, and the site entrance, as needed, to maintain safe and adequate traffic flow;
  - Pest control including control of such pests as rodents and insects;
  - Preventative maintenance including such items as changing air filters and testing diesel generators;
  - Corrective maintenance including such items as changing light bulbs, replacing leaking pump seals, resetting circuit breakers, and performing minor repairs;
  - Troubleshooting malfunctioning items and systems related to facilities;

- Coordinating outside subcontractors with such items as pest control and equipment inspections;
- Maintenance, testing, upgrades, modifications, and additions to the fire protection system including, but not limited to, distribution piping and equipment, fire hydrants, and monitoring capability;
- Maintenance, testing, upgrades, modifications, and additions to the domestic water system including, but not limited to, additional distribution points (buildings), distribution piping and equipment;
- Maintenance, testing, upgrades, modifications, and additions to wastewater handling capability at the site.

2.1.4 Site Planning Assumptions

The overall balance of program activities and personnel assigned to the STM and DWOP sites, respectively, would be expected to change and fluctuate over time based on site management efficiencies and associated federal budget priorities and funding. Site planning assumptions are specified for the proposed S&TF, but remain flexible for other improvements. This flexibility reflects the current need for long-term site planning studies that would guide and refine future development proposals in terms of sites for specific uses and constraints on future building designs.

Current site planning assumptions do not include on-going site planning efforts or previously developed conceptual plans for the STM site. However, the old plans help define the parameters for the bounding analysis in this EA. In 2002, NREL began a new site planning effort to develop a 25-Year General Development Plan for both of NREL's sites (both STM and NWTC). The outcome of the effort will be a single unified vision for the STM site. The resulting plan will be flexible enough to allow for adaptation so it continues to align with laboratory and program priorities as they change over time.

In some instances, previous plans included drawings showing locations for specific facilities and buildings, building perimeters, site access configurations and overall site development philosophies. Although these drawings show considerable detail, they present different alternatives and are not current proposals. These plans may or may not reflect future outcomes and do not relate directly to conditions anticipated in 2008.

As described in Sections 2.1.1 and 2.1.2, the STM site has been divided into zones and the Proposed Action has been divided into components. Table 2-1 provides a summary that clarifies potential locations for each primary component of the Proposed Action by zone.

Table 2-1. Summary of Potential Locations for Each Primary Proposed Action Component by Zone.

Proposed Action Component	Zone 1 Mesa Top	Zone 2 Conser-vation Area	Zone 3 West Campus	Zone 4 Central Campus	Zone 5 East Campus	Zone 6 Camp George West Parcel	Zone 7 Historic Resources
Science and Technology Facility				X			
New laboratories for plant biotechnology and research			X	X	X	X	

greenhouses							
Biorefinery pilot-scale facility			X	X	X	X	
Microbial water-gas shift pilot plant			X	X	X	X	
Facilities for whole building testing, integrated building/transportation energy systems, and consolidating staff and laboratory space			X	X	X	X	
Facility for large vehicle test research			X	X	X	X	
Laboratory facilities for expanded fundamental hydrogen research			X	X	X	X	
New facility for larger scale hydrogen process development and integration			X	X	X	X	
Additional space for computing facility and increased connectivity			X	X	X	X	
Visitor's Center Expansion					X		
Visitor's Center Parking Expansion					X		
Research Support Facilities			X	X	X	X	
Modification of Existing Facilities	X		X	X	X	X	
Expansion of SRRL	X						
Expansion of FTLB				X			
Zero Energy Building			X	X	X	X	
Small scale wind turbine research and development			X				
Infrastructure Modifications and Improvements	X		X	X	X	X	
Operations and Maintenance	X		X	X	X	X	

The following additional site development assumptions would also apply.

- Only facilities and facility modifications presenting environmental consequences and risks approximately equivalent to existing facilities would be added.
- Security gates at the west and east ends of the site would remain in place to control site security and limit public access to the site.
- No major, off-site road or utility services would be implemented.
- New buildings and building modifications would have heights that do not exceed five stories above ground level.
- New buildings would be set back from the STM site's parcel boundaries. These setbacks would vary and would be determined during the site planning process and/or during the final design processes for individual buildings.

The following discussion provides a description of anticipated future improvements at the STM Complex by 2008 in terms of growth over time in employment and facility square footage.

2.1.5 Site Development, Occupancy and Phasing

The number of workers and square footage of space at the STM Complex would be expected to increase as components of the Proposed Action are implemented. Workers are defined as full

and part time employees, contract employees, consultants and others who work on the site. The total figures for workers presented in the following discussion represent estimates of the annual average number of workers at the STM and DWOP sites. The anticipated increase in workers from 2002 to 2008 is anticipated to occur as follows:

- Worker totals would increase by up to five percent compounded annually; and
- The relative proportions of personnel between STM and DWOP would change such that 75 percent of anticipated worker increases would be housed at the STM site with the remainder at the DWOP site.

Table 2.2 provides estimated present and future workers on both sites based on these assumptions. Table 2.3 presents estimated future total net building square footage figures to generally characterize corresponding construction phasing. No other construction phasing assumptions for the components of the Proposed Action are proposed.

Table 2-2. Estimated Present and Future Workers at the STM and DWOP Sites.

Site	2002 Workers	2008 Workers
STM	400	669
DWOP	655 *	745
TOTAL	1055	1414

***** Includes 55 DOE GO workers

Note: The figure of 1055 workers was increased five percent compounded annually for 2003, 2004, 2005, 2006, 2007, and 2008. The total was distributed between the STM and DWOP with 75 percent at STM and 25 percent at DWOP

Table 2-3. Current and Estimated Future Building Square Footage at the STM and DWOP Sites.

Site	2002 and 2003	2008
STM	324,231	450,000
DWOP	214,514*	250,000
TOTAL	538,745	700,000

* Includes DOE GO

This EA assumes that additional square footage needs in DWOP by 2008 would be met by leasing additional space in buildings within the DWOP that are currently occupied by DOE or others.

2.2 NO ACTION

The No Action Alternative would leave the STM in its current configuration, add no new facilities, and maintain current levels of research, operation and management activities. No significant changes to current levels of research, operation and management activities would occur at the DWOP.

As described in Chapter 1, the types of research and development that these sites support would not change nor would the existing facilities. Work would continue to improve technical designs, improve power generation efficiencies, increase economic competitiveness, transfer technologies to industry, and fully characterize and minimize environmental impacts from various technologies. The EERE research and development program focus areas would continue to include, but not be limited to:

- Solar;
- Wind and Hydropower;
- Geothermal;
- Distributed Energy, Electrical Infrastructure and Reliability;
- Biomass;
- Industrial Technology;
- Freedom Car and Vehicle Technology;
- Hydrogen and Infrastructure;
- Buildings;
- Weatherizations and Intergovernmental Grants; and
- Federal Energy Management Program.

In addition, the sites would continue to support:

- Other DOE Sponsored Programs, and
- Work for Others Supporting the DOE Mission.

Routine operations and maintenance would occur in the future as it does at this time.

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3. AFFECTED ENVIRONMENT

Chapter 3 of this Site-Wide EA describes the existing environmental, social and economic conditions directly and indirectly related to the STM and DWOP sites, site circumstances, and the Proposed Action.

3.1 LAND USE, PLANNING, PUBLIC POLICY, SOCIOECONOMICS

3.1.1 Existing Land Uses

Project Site

The project site includes NREL's STM site, owned by the DOE, and interior office space within DWOP that is leased to NREL. Combined, these sites provide 516,000 sf of facilities and workspace for approximately 1,000 workers (employees, temporary personnel, and contract workers).

The STM site is located on the southeast side of South Table Mountain within unincorporated Jefferson County, near the City of Golden, Colorado, and immediately west of lands recently annexed by the City of Lakewood, Colorado. The STM site is located approximately 12 miles west of downtown Denver (see Figure 1-1). In general, land uses adjacent to the STM site include open space to the north; commercial and residential development to the east; residential development and undeveloped areas to the south; and residential development and open space and undeveloped areas to the west.

The STM site occupies 327 acres including lands located on the mesa top, slope, and toe of South Table Mountain. Of these 327 acres, 136 acres are available for development, 14 acres are restricted from development because of access and utility easements, and the remaining 177 acres are protected by a conservation easement. The conservation easement was established in exchange for 25 acres of developable land that is included in the 136 developable acres on the southernmost portion of the site. All existing facilities are within this 136 acres. Jefferson County is designated as the "beneficiary" of this conservation easement. There are approximately 104.7 acres of mesa top land within the STM site. Approximately 91.6 acres of mesa top land are within the easement area, leaving 13 acres of mesa-top land for development (see Figure 1-3).

Developed land uses at the site include research and development facilities, office space, support buildings, and testing areas. Table 3.1 presents the square footages, the zone in which they are located, and a description of the permanent buildings and facilities at the STM site. Refer to Section 2.1.1 for a detailed description of the zones at the STM site.

The DWOP site is located approximately 0.5 miles (3 kilometers) east of the STM site within an area recently annexed by the City of Lakewood and within the Denver West Metropolitan District (see Section 3.1.2 for more detailed information on the Denver West Metropolitan District).

NREL leases 191,787 sf of space within Buildings 15, 16, 17, and 27 of the DWOP (see Figure 1-2). Buildings 15, 16, 17, and 27 house DOE GO staff and over 50 percent of NREL's existing staff, and provide administration, research support activity areas and limited laboratory research. The lease for these buildings will expire as follows:

- Building 15 during March 2006;

- Buildings 16 and 17 in mid-FY 2004; and
- Building 27 in early FY 2005.

Table 3-1. Square Footage of Existing Buildings at the STM Site.

Buildings	Gross Square Feet	Zone	Description
Solar Energy Research Facility (SERF)	115,556	4	The SERF is the most prominent building at the STM site and provides-low bay laboratories and associated office space for research and development activities for fundamental science and PV.
Field Test Laboratory Building (FTLB)	118,091	4	The FTLB serves as a multi-purpose facility with low-bay laboratories, high-bay research areas, and associated office space.
Alternative Fuels User Facility (AFUF)	32,597	3	The AFUF contains a laboratory and office space as well as the PDU pilot plant.
Outdoor Test Facility (OTF)	11,247	3	The OTF provides office space and indoor laboratory facilities in support of the outdoor PV test area immediately east of the OTF.
Shipping & Receiving (S&R) Facility	14,207	3	--
Thermal Test Facility (TTF)	10,682	3	The TTF provides open bay and rooftop test areas, work space for technicians researching building thermal systems, and space for battery research for transportation systems.
Visitor's Center	6,459	5	--
Bulk Storage Building	3,792	3	--
Facility Maintenance Building	3,787	3	--
Solar Radiation Research Laboratory (SRRL)	2,688	1	The SRRL contains solar radiation measurement and metrology functions. The SRRL is the only permanent facility on the mesa top.
Waste Handling Facility	1,065	3	--
Site Entrance Building	814	5	This building provides space for security personnel and provides badges for site visitors
High Flux Solar Furnace	730	1	--
High Flux Solar Furnace	184	1	--
Solar Industrial Mesa Test Area (Building 7421)	544	1	--
Solar Industrial Mesa Test Area (Building 7521)	576	1	--
Historical Bunker	386	7	--
Camp George West Ammobunker	361	7	--
TOTAL	323,766	-	-

Denver West Realty manages Buildings 15, 16, 17, and 18. Building 27 is owned by the Jefferson County School District.

Surrounding Areas

The areas surrounding the STM and DWOP sites are within portions of unincorporated Jefferson County, as well as the Cities of Golden and Lakewood municipalities within Jefferson County. The Pleasant View Metropolitan District, within unincorporated Jefferson County, overlays portions of each of these jurisdictions (see Figure 3-1).

Specific uses adjacent to the STM site include the following:

- Camp George West;
- Colorado State Highway Patrol Driver Training Track and Jefferson County open space land to the northwest;
- Camden Denver West multi-family residential development and office buildings to the east;
- Residential development within the Pleasant View Metropolitan District and open space planned for a park to the south;
- Offices and a nursery associated with the Colorado Division of Forestry, and residential development and a neighborhood park within Pleasant View to the west; and
- A Marriott Hotel is located east of the STM site, north of Building 27 and southwest of Buildings 15, 16, and 17.

General land uses surrounding the DWOP site include commercial uses to the north and west and commercial and residential uses to the east. The recently completed Colorado Mills Mall is located on the south side of West Colfax Avenue southwest of NREL's DWOP facilities. I-70 bisects the DWOP (see Figure 3-1).

Camp George West currently comprises approximately 100 acres located south of the STM site (see to Figure 1-2). Camp George West was established in 1903 as the Colorado National Guard's (CNG's) permanent rifle and range facility. Lands associated with the Camp totaled 750 acres during the mid-1920s to late-1930s, including the acreage comprising the current STM site (DOE had been a tenant of the State of Colorado prior to acquiring the STM property in 1981). Jefferson County also acquired a significant portion of former Camp George West lands. In addition to providing storage, maintenance, and classroom space for the CNG, the remaining lands known as Camp George West currently provide land for a variety of tenants including the Colorado Office of Emergency Management, Colorado Department of Transportation, Colorado State Patrol, and the Colorado Correctional Center at Golden. However, the CNG is in the process of relocating space at Camp George West. The State of Colorado has received several requests for reuse of the site. The Camp George West Historic District, which includes portions of the present Camp George West site and the STM site, was placed on the National Register in 1993 (Colorado Department of Corrections, 2002).

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3.1.2 Applicable Local Plans, Policies, and Anticipated Future Development

Although the land use plans and policies of local governments are not applicable to federal lands, these plans and policies set forth important affected environmental context for the site and surrounding areas. The following discussions focus on zoning, land use and planning matters. Policies associated with specific technical issues, such as traffic and visual resource protection, are addressed in the corresponding sections of this EA.

Jefferson County

The Jefferson County General Land Use Plan (GLUP), adopted in 1986, provides policies and land use recommendations for the site. The GLUP does not provide a specific land use recommendation for the STM site, rather it states the area as Camp George West. The GLUP is currently being updated, and is expected to be adopted in Fall 2003.

The STM site is currently zoned A2, which permits "general farming, ranching, intensive agriculture uses, and agriculturally related uses while protecting the surrounding land from any harmful effects." The minimum lot size for the A2 zone is 10 acres.

According to the Jefferson County zoning map, designations surrounding the STM site include A-2 to the north; A-2, Planned Development Amended (P-D AMD) and Residential Two (R-2) to the east; A-2 and Residential One B to the south; and A-2 and Agriculture One (A-1) to the west. District designations surrounding the DWOP site are primarily P-D AMD. Jefferson County defines the P-D zone district as "… a versatile zoning mechanism allowing for land development of any nature (residential, commercial, conservation, mining, industrial, public or quasi-public, etc.) either as a single use or in combination, through total integrated project planning." The R-2 zone district "… is intended to provide areas for low to medium density residential development and includes both one-family and two-family dwellings." The A-1 zone district "… is intended to provide for limited farming, ranching and agriculturally related uses while protecting the surrounding land from any harmful effects." The minimum land area for this zone is five acres (Jefferson County, 2002).

Lakewood, Golden, Denver West, Pleasant View

The City of Lakewood addresses land use issues associated with the DWOP site and areas generally east of the STM site. The DWOP site is zoned Planned Development (PD) by the City of Lakewood (Siley, 2002). According to the Lakewood Zoning Ordinance (September 1, 2000), the PD zone district "… is intended to permit the planning and development of substantial parcels of land which are suitable in location and character for the uses proposed as unified and integrated developments in accordance with detailed development plans" (City of Lakewood, 2002).

The current Lakewood Comprehensive Plan, adopted in 1987, is being updated. Details of the Comprehensive Plan Update are not available at this time. Lands immediately east and southeast of the STM site, including the DWOP site, were recently annexed by the City of Lakewood and are referred to as the Denver West Center. Zoning for this area, which generally encompasses an area south of I-70, east of Indiana Street, north of 6th Avenue (U.S. Highway 6), and west of Hawthorne Road, is designated P-D. The ongoing development of this area is

within the jurisdiction of the Denver West Center Official Development Plan and includes the Mills Mall (Siley, 2002).

The City of Golden addresses land use issues to the west of the project area within its incorporated limits. The City of Golden is also in the process of updating their existing *City of Golden Comprehensive Plan Vision 2010* that was adopted in 1993. North and South Table Mountains are considered the City's future eastern boundary according to the Planned Urban Growth Map associated with the existing Comprehensive Plan. It is anticipated that lands surrounding Golden within unincorporated Jefferson County, east of South Table Mountain, will comprise transitional urban uses. An aspect of the Plan's Urban Growth Plan is the development of a park and open space system that provides links between local facilities, neighborhoods, and the Jefferson County Open Space regional system, including a link that incorporates the trail system associated with South Table Mountain (City of Golden, 2002).

The Denver West Metropolitan District was organized in 1984 and is generally located east of the STM site. In 1998, the Lena Gulch Metropolitan District was established as an associated service district to own and operate the public facilities, while the Denver West District was redesignated the financing district to generate the tax revenues to pay the costs of capital improvements (see Figure 3-2). These entities are collectively referred to as "the Districts." The general boundaries of the Districts, located almost entirely within the City of Lakewood, are Indiana Street to the west, 8th Avenue to the South, 20th Avenue to the north, and Alkire Street to the west. The total area of the Districts is 525 acres. The recently completed Colorado Mills Mall is within the Denver West Metropolitan District. In 2001, the Districts submitted the *Amended and Restated Service Plan for Denver West Metropolitan District and Service Plan for Lena Gulch Metropolitan District* in order to address the need for increased services in the Denver West Area. Major projects (those for which over $1 million is budgeted) included in this plan include Colfax Phase I ($5.2 million), Indiana/Colfax Phase II ($7.1 million), and 6th Avenue Interchange ($4.9 million) (White and Associates Professional Corporation, 2001).

The Pleasant View Metropolitan District is generally located south of the STM site (see Figure 3-2). This District is in the process of updating its 10-Year Plan to guide future development of the District. The District has also prepared a Master Plan for the Development of Camp George West Park immediately south of the STM site. The area for the proposed park currently includes open space and several historic structures (refer to Section 3.11 Cultural Resources). Construction of Camp George West Park, scheduled to begin in late 2002, will include: a lighted competition baseball/softball field; a loop trail system; a maintenance yard; two large, open multi-use field areas; a playground; restroom/concession facilities; picnic facilities; and use of the existing recreation hall and/or gun club. Construction of the park is expected to occur in multiple phases, with the first phase to include a ball field on the eastern portion of the site and gravel parking areas. Completion of Phase 1 is expected in 2003. The second phase is anticipated to involve drainage work on the western portion of the site to facilitate development of a western ball field (Wilber, 2002).

INSERT FIGURE 3-2 HERE – METROPOLITAN DISTRICT FINANCE AREA

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Overall Future Development Pattern

In addition to Pleasant View's Camp George West Park development, local governments anticipate that infill development will occur within Pleasant View to the south and on sites recently annexed or soon to be annexed by the City of Lakewood to the east over the next several years. Existing open space and undeveloped land west of the STM site and the remainder of the South Table Mountain mesa are not currently associated with any development plans at this time or in the near future. However, in the past, a privately held portion of the mesa top has been the subject of controversial development proposals. These developments have included plans for rock quarrying and a commercial office campus proposed by the Nike Corporation. Both of these proposals were denied.

3.1.3 Population Growth

The U.S. Census Bureau, state governments, and various local governments collect demographic information. The U.S. Census Bureau has released summaries of the information that was accumulated during the 2000 Census. The following sections present information relevant to population growth in the project site area.

Jefferson County, Golden, Lakewood, Pleasant View

Jefferson County is Colorado's second largest county in population. Jefferson County grew 20.2 percent from a population of 438,430 in 1990 to 527,056 in 2000. The county increased by 88,626 persons, a yearly growth rate of about 2 percent. Golden's population grew from 13,138 in 1990 to 17,159 in 2000, an increase of 30.6 percent (DRCOG, 2002). Lakewood is the largest municipality within Jefferson County. Lakewood's population grew from 126,481 in 1990 to 144,126 in 2000, an increase of 13.95 percent (DRCOG, 2002). The Pleasant View Metropolitan Area's population increased from 3,664 in 1990 to 4,037 in 2000 (U.S. Census, 2002).

Denver-Boulder Metropolitan Area

The Denver-Boulder metropolitan area grew nearly 30 percent, from 1.85 million in 1990 to 2.4 million in 2000. For comparison, the Colorado Springs metropolitan area also grew 30 percent from 397,000 to 517,000, and the Greeley and Fort Collins metropolitan areas both grew faster, at 37.3 and 35.1 percent, respectively. Based on the 2000 census, Denver was the largest county, with a population of 554,636 persons.

Colorado

Between 1990 and 2000, Colorado grew from 3.3 to 4.3 million people. The increase of slightly over 1 million persons was a 30.6 percent increase from 1990. The ten counties of the metropolitan Front Range increased from 2.7 million in 1990 to 3.5 million in 2000, or 30.0 percent, slightly less than the state average. However, the 800,000-person increase in population in these 10 counties constituted over 80 percent of the increase in the state total.

3.1.4 Ethnicity and Income

Colorado's population in 2000 was defined by the U.S. Census to be 82.8 percent white, compared to the U.S. average of 75.1 percent. Jefferson County's 2000 population was defined

by the U.S. Census as 84.9 percent white, 10.0 percent hispanic, and 0.9 percent black. Golden's 2000 population was defined by the U.S. Census as 87.0 percent white, 6.6 percent hispanic, and 1.0 percent black. Lakewood's 2000 population was defined by the U.S. Census as 78.9 percent white, 14.5 percent hispanic, and 1.5 percent black (DRCOG, 2002). Census Tract 101 in Jefferson County, Colorado encompasses the STM site and the portion of the Pleasant View Metropolitan Area closest to the STM site. Census Tract 101's 2000 population was defined by the U.S. Census as 91.3 percent white, 8.2 percent hispanic, and 1.3 percent black (U.S. Census, 2002).

Definitions for what constitutes a "low-income" household vary according to: the number of persons living in the household; federal, state and local government definitions and thresholds, and income distributions in a given area.

The median household income for Census Tract 101, encompassing the residences south of the STM site (south of Zones 3, 5 and 6), is $40,872 based on 2000 Census data. This figure is 71 percent of the median household income for Jefferson County. Households earning less than 80 percent of the County's median household income are considered "low income" households by the County and may qualify for affordable housing assistance within the County (Newman, 2003). Given this definition, Census Tract 101 should be considered a concentration of low-income persons.

The median household income for Census Tract 98.06, encompassing the residences east of the STM site (east of Zone 5), is $80,460 based on 2000 Census data, or 140 percent of the median household income for Jefferson County. Given the County's definition, this area should not be considered a concentration of low-income persons.

Based on these data and site observations, there are no concentrations of minority populations near the STM site, but Census Tract 101 could be considered a concentration of low income persons.

3.2 TRAFFIC AND CIRCULATION

The following discussion is based on consultation with local governments (Buchholz, 2002) and the information and findings presented in a Traffic Impact Study prepared by Felsburg Holt & Ullevig for the STM site in November of 2002 (NREL (FHU), 2002).

3.2.1 Traffic Network: Site Circulation and Access

The traffic network serving the STM and DWOP sites is primarily composed of Denver West Parkway, Denver West Marriott Boulevard, West Colfax Avenue (U.S. 40), I-70, Cole Boulevard, and various local streets (see Figure 3-1).

The I-70/Denver West Marriott Boulevard interchange provides regional access to the STM and DWOP sites. Denver West Marriott Boulevard is a 4-lane, divided roadway that extends between West Colfax Avenue and Denver West Parkway.

Denver West Marriott Boulevard intersects Denver West Parkway just north of the I-70/Denver West Marriott Boulevard interchange. Denver West Parkway is a four-lane, divided collector that parallels the north side of I-70 between the STM site and 20th Avenue. Denver West Marriott Boulevard is a north-south roadway connecting Denver West Parkway and West Colfax

Avenue. It features four lanes with auxiliary turn lanes and provides signalized intersections at Denver West Parkway, the I-70 ramps, Cole Boulevard, and West Colfax Avenue. These interchanges are spaced at roughly 400-foot intervals. The intersection of Denver West Marriott Boulevard and Denver West Parkway is currently controlled by a new traffic signal. Denver West Parkway provides primary access to the STM site and Building 27 within the DWOP.

The main entry to the NREL (STM) site is at the western terminus of Denver West Parkway about 2,000 feet west of the Denver West Parkway/Denver West Marriott Boulevard intersection. Gates control this entry point and a second entry point to the STM site off of Quaker Street. However, public access to parking areas near the Visitor's Center and security building is not controlled by the gate. The Quaker Street access point and security gate is located west of the main gate (see Figure 3-1). These entry points control interior access to roads within the lower portion of the STM site.

Quaker Street provides access to the STM facilities located on the mesa top. Quaker Street is paved to a point just north of the STM west gate. Beyond this point the road is unimproved. A gate is located at this location, but it is only closed and locked at night. The gate is open during the day because the road provides access to public open space. However, upon reaching the STM facilities on the mesa top, a security gate controls access to STM facilities. An access card is required to gain entry at the mesa top security gate and at the other two primary STM site gates.

Building 27 is located off of Denver West Parkway. Buildings 15, 16, and 17 of the DWOP site are located about 0.5 miles (1 kilometer) east of the STM site on Cole Boulevard, which can be accessed via West Colfax Avenue and Denver West Marriott Boulevard (see Figure 3-1).

Regional access to the STM site is provided by I-70, which is a major east-west, six-lane facility and a primary route for commuters and travelers to and from the mountains. I-70 interchanges in the vicinity of the project area include West Colfax Avenue and Denver West Marriott Boulevard. Because there is not a westbound to eastbound on-ramp from West 6th Avenue (U.S. 6) onto I-70, motorists on U.S. 6 must exit onto Indiana Street and use one of the on-ramps at either West Colfax Avenue or Denver West Marriott Boulevard to access I-70 eastbound. This limitation results in additional traffic volumes on local streets in the vicinity of the project area (Wells & Associates, LLC, 2000).

West Colfax Avenue is a major east west divided arterial roadway. Reconstruction of this road was recently completed to serve the new Colorado Mills Mall and other needs. Signalized intersections are located at the I-70 ramps, Indiana Street, the Denver West Village entrance, Denver West Marriott Boulevard, and the Cole Boulevard/Hawthorne Road intersection.

3.2.2 Traffic Volumes and Levels of Service

Existing vehicular traffic was counted along Denver West Marriott Boulevard during the morning (AM) and evening (PM) peak traffic periods of a weekday in August 2002 prior to the opening of the Colorado Mills Mall. Specifically, approach and turning traffic was counted at the following intersections:

- Denver West Marriott Boulevard and Denver West Parkway;
- Denver West Marriott Boulevard and the I-70 North Ramps;
- Denver West Marriott Boulevard and the I-70 South Ramps.

Figure 3-3 presents the existing peak hour traffic counts for these intersections. The raw traffic count data is also provided in the Appendix of the Traffic Impact Report.

Using methods documented in the *Highway Capacity Manual*, (Transportation Research Board, Third Edition, 2000), the existing peak hour traffic volumes identified on Figure 3-3 were analyzed to determine existing operational conditions (levels of service). The *Highway Capacity Manual* describes traffic operational conditions with a level of service (LOS), which is a qualitative measure based on the average delay per vehicle at a controlled intersection. An LOS is described by a letter designation of either A, B, C, D, E or F. An LOS "A" represents conditions with minimal delay, while a LOS "F" represents conditions with much longer delays. Typically, a LOS of "D" or better is considered to be acceptable operational conditions.

Figure 3-4 summarizes the existing levels of service at each of the study intersections. The results of the analyses indicate that all of the study intersections currently operate at an acceptable LOS. Specifically, the Denver West Marriott Boulevard/Denver West Parkway intersection operates at LOS "A" and LOS "B" during the AM and PM peak hours, respectively. Both of the ramp terminals along Denver West Marriott Boulevard operate at LOS "B" or better during the peak hours.

3.2.3 Future Improvements

Improvements associated with the recently opened Colorado Mills Mall development have enhanced the transportation network in the project vicinity. However, additional improvements are set forth in Jefferson County's Countywide Transportation Plan (CWTP). Preparation of the CWTP was initiated in 1995 as a cooperative effort between Jefferson County and the cities of Arvada, Broomfield, Golden, Lakewood, Westminster, and Wheat Ridge. The CWTP resulted in the adoption of six goals for the County's transportation system (Jefferson County Highways and Transportation Department, 1998):

1. Identify and address deficiencies in the County transportation system.
2. Provide a coordinated system that integrates all modes of motor vehicles, transit, bicycle, and pedestrian transportation.
3. Provide for and improve the mobility of those who have special needs or are dependant on public or specialized transportation.
4. Encourage Jefferson County and associated cities to work together to provide consistent plans and maximize influence on the regional transportation planning process.
5. Mitigate the impact of transportation on the environment and communities.
6. Encourage economic vitality.

The "Project List" in the CWTP includes the following roadway improvements in the vicinity of the project area:

- Widening South Golden Road from two lanes to four lanes between Indiana Street and Ulysses Street; and
- Widening West Colfax Avenue from four lanes to six lanes from I-70 to U.S. Highway 6.

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The following interchange/intersection improvements are included in the CWTP Project List:

- Conducting a study to determine the feasibility of eliminating the skewed, at-grade signalized intersection at U.S. Highway 6/West Colfax Avenue;
- Investigating alternatives for intersection of U.S. Highway 6/Indiana Street; and
- Adding turn lanes at major intersections along Indiana Street and West Colfax Avenue.

3.2.4 Accidents

The Colorado Department of Transportation (CDOT) was contacted to determine accident history along I-70 in the vicinity of the STM and DWOP sites. Data were obtained for the five-year period from January 1, 1996 to December 31, 2000 between mileposts 261.57 to 263.57, which include the on-ramps and off-ramps associated with West Colfax Avenue and Denver West Marriott Boulevard. In summary, there were a total of 220 reported accidents along this two-mile (3.2 kilometers) portion of I-70. Four people were killed in two separate accidents and a total of 93 people were injured in 71 injury accidents along this segment of I-70. Additionally, 147 accidents that resulted in property damage only occurred (Ellison, 2002).

Accident data for local streets is not compiled by CDOT. Local governments have not compiled accident data for local roads and intersections in the project area

3.2.5 Transit/Bicycle/Pedestrian Circulation

Bus service to the project site is provided by the Denver Regional Transportation District's (RTD's) Route 20-125 bus line, which includes a stop at the STM Visitor's Center. This bus line operates between 5:16 a.m. and 6:10 p.m. on weekdays between the STM site and downtown Denver. During the morning and evening peak commuter periods, buses stop at the Visitor's Center approximately every half hour (RTD, 2002).

Several planned bike paths are located in the vicinity of the STM site. The CWTP includes improvement of segments of South Golden Road and West Colfax Avenue as "Existing Plus Committed Projects" associated with the Bicycle/Pedestrian Plan.

Pedestrian access to the STM site is provided via Denver West Parkway. Trail easements exist on-site along the eastern boundaries of the STM site and off-site trails just west of the site's western boundary. These trails provide access to open space areas located north of the STM site. An access easement located along the eastern edge of the 25-acre Camp George West parcel provides access between the security building and the future site of Camp George West Park (see Figure 2-1). The mesa top lands within STM's conservation areas are open to the public.

3.3 AIR QUALITY

NREL implements an Air Quality Protection Program under NREL Policy 6-2, Program 6-2.5. The purpose of the program is "to prevent the degradation of local air quality while helping to preserve the quality of the local and regional air shed to the maximum extent possible." The program applies to stationary sources and mobile sources, such as vehicles. NREL project managers notify the NREL ES&H Office prior to the beginning of any project that poses the potential for air emissions. The NREL ES&H Office evaluates air emissions and permitting requirements early in a project's planning phase. The NREL ES&H office is notified of new fuel-

burning equipment and changes in the status of existing equipment. The ES&H Office contacts the Colorado Department of Public Health and Environment (CDPHE) when necessary. NREL operates all facilities at the STM and DWOP sites in compliance with all applicable regulations. DOE provides oversight to verify compliance with those regulations.

3.3.1 Climate

The STM and DWOP location is characterized by a semiarid climate that exhibits large seasonal and short-term temperature variations typically associated with movement of large continental air masses. The central Rocky Mountains are usually dominated by high pressure. The plains are usually dominated by low pressure. High pressure frequently governs the weather along the Front Range resulting in fair, dry conditions at the STM site. Although the average daily temperatures at the STM site are moderate, large diurnal temperature variations result from the site's 5,800-foot elevation and thinner atmosphere. Average daily winter temperatures range from 9° to 48° Fahrenheit (F). Average daily summer temperatures range from 59° to 90°F. Temperatures are generally above freezing from about mid-May through mid-September. The site receives on average approximately 16 inches of precipitation per year. Fifty percent of the precipitation occurs from March through June. The average seasonal snowfall is approximately 65 inches. There are occasional periods of severe drought along the Front Range. Average mid-afternoon humidity is approximately 40 percent (Department of Agriculture, 1980). Average wind speeds are approximately nine miles per hour (mph), primarily from the southwest and south-southwest (NREL, 1993).

3.3.2 Air Quality Regulatory Authorities

Ambient air quality in a given location is characterized by comparing the concentration of various pollutants in the atmosphere to the standards set by federal and state agencies. The purpose of these standards is to allow an adequate margin of safety for the protection of public health and welfare from adverse effects resulting from pollutants in the ambient air. The primary pollutants of concern for which federal and state ambient air quality standards have been established include criteria pollutants, hazardous air pollutants (HAPs), and other toxic air pollutants.

National Ambient Air Quality Standards (NAAQS) set the absolute upper limits for specific air pollutant concentrations in order to protect human health. These pollutants are called criteria pollutants and consist of carbon monoxide (CO), nitrogen oxides (NO_X), sulfur dioxide (SO_2), ozone, particulate matter less than 10 microns (PM-10), lead, and volatile organic compounds (VOCs). A geographic area that meets or exceeds the limit for a particular criteria pollutant is called a nonattainment area. Areas where pollutants are measured below the limits are called attainment areas. The Denver metropolitan area is in attainment for all criteria pollutants as of August 2002.

The EPA recently revised both the ozone and particulate matter less than 2.5 microns in effective diameter (PM-2.5) NAAQS; however, the revised limits are currently being contested in the federal judicial system. If, after approval is achieved on the federal level, it is determined that specific areas in the State of Colorado are not in attainment with the new limits, the Colorado State Implementation Plan must be revised.

The National Emission Standards for Hazardous Air Pollutants (NESHAPs) are designed to protect human health and the environment by reducing toxic air emissions. The underlying

authority for NESHAPs is Title III of the Clean Air Act Amendments of 1990 (CAAA-90), which established a listing of HAPs. Title III of the CAAA-90 specified requirements for the EPA to identify those source categories that emit, or have the potential to emit, one or more HAPs. For each source category identified, the EPA was directed to promulgate NESHAPs using standards that are modeled on the best practices and most effective emission reduction methodologies in use at the affected facilities. Threshold quantities determine application of various requirements or exemption from those requirements.

The State of Colorado has primacy to administer the Clean Air Act within the State. The Colorado Air Quality Control Commission (CAQCC) Regulation No.3, Air Contaminant Emissions Notices, provides the provisions for construction and operating permits. An Air Pollution Emission Notice (APEN) is required for each individual emission point in an attainment area with uncontrolled emissions of 2 tons per year (TPY) or more of any individual criteria pollutant or 100 pounds per year of lead.

Prevention of Significant Deterioration (PSD) regulations limit emissions of pollutants from new sources in attainment areas. To implement its policy of non-degradation, the EPA designated types of areas in which certain types of increments of additional pollution would be allowed. Class I areas include federal lands such as national parks, national wilderness areas, and national monuments. These areas are granted special air quality protections under Section 162(a) of the federal Clean Air Act. Class II areas allow additional, well-controlled growth. Under PSD regulations, a construction permit may be necessary to install a new stationary source or modification of a stationary source (any building, equipment, structure, facility, or installation or any combination, including construction activities) prior to initiation of construction activities. Construction permits are issued on the basis of production/process rates as detailed in the APEN submitted with the permit application or as requested in the application as related to emissions of criteria pollutants and HAPs. The STM site is located in a Class II PSD area for criteria pollutants for which the area is in attainment. The nearest Class I area is Rocky Mountain National Park, approximately 40 miles to the northwest of the site.

The emission of radionuclides other than radon from DOE facilities is regulated under 40 CFR 61 NESHAPS. The requirements establish a radionuclide emission standard equal to those emissions that yield an effective dose equivalent (EDE) of 10 millirems per year to any member of the public. The requirements also address measuring and monitoring fugitive emissions of airborne particles that may contain radionuclides. NREL and DOE submit an annual compliance report to EPA. Notification to the EPA is also required when emission limits are exceeded. The use of low-level radioactive materials is described in Section 3.10.1.

3.3.3 Emission Sources

Emissions sources at DWOP include those from an outdoor emergency generator located at Building 16, vehicles and limited laboratory activities. Monitoring of DWOP emissions is not required or performed. Emissions at the STM site include those generated by stationary sources during normal and emergency site operations and emissions from vehicles.

An air emissions inventory dated July 2001 indicates that the STM site lists 36 stationary sources of air emissions. The sources consist of boilers, hot water heaters, emergency generators, building heaters, and a thermochemical process development unit (TCPDU or thermal oxidizer) used for research activities. Emissions from the 2001 inventory are listed in Table 3.2. Potential emissions values reflect the operation of all sources of emissions at the site

on a continuous year-round basis at full capacity. Actual emissions of these pollutants from the site are much less than potential to emit because the sources operate intermittently and at less than full capacity.

Table 3-2. Annual Emissions at the STM Site (TPY), 2001

	Particulates	SO_2	NO_x	CO	TOC
Potential to Emit	2.86	5.18	46.41	23.21	3.63
Actuals	0.39	0.13	5.33	3.87	0.55

Source: Compiled from STM July 2001 Emissions Inventory

With respect to HAPs, the STM site emits extremely small quantities of materials from laboratory hoods. Examples of the source of these HAPs include acetone, cyclohexane, toluene, xylene, phosphoric acid, and sulfuric acid. The emission quantities are well below notification and permit thresholds.

The site also presents the potential to emit accidental releases of toxic, highly toxic and corrosive gases, such as those used in the SERF laboratory areas. The potential for accidental release of these gases exists, but NREL's existing environmental management processes, procedures, facility design specifications, and programs establish requirements for the handling, storage and use of these gases to minimize the likelihood of a release. Specific programs that address related issues such as the Risk Assessment Program and Compressed Gas Safety Program. In combination, these practices prevent adverse air quality impacts offsite and involving NREL personnel at NREL sites and facilities.

The ethanol PDU (in the AFUF) is equipped with scrubbing equipment intended to reduce or eliminate potential odor causing emissions. Other activities on the STM site have the potential to generate low levels of odors with minimal potential to migrate offsite.

Fugitive dust is also emits from the STM and DWOP sites in the form of emissions that are unplanned and escape from a process by a route other than a stack, chimney, or vent. These emissions are minor. Another source of fugitive dust is wind blown soil. Construction activities at the STM site have the potential to increase fugitive dust generation by disturbing soil.

3.3.4 STM Site Permit Status

The STM site operates under two Colorado Air Pollution Control Division (CAPCD) permits. An APEN was submitted to the CAPCD in May 1999 in association with the intent to scale up a research project that uses biomass materials to produce liquid and gaseous products. Construction Permit Number 99JE0400 associated with the TCPDU was issued in April 2002 for its installation.

A second APEN was submitted to the CAPCD in November 1999 in association with land development activities on the site. The second permit, Permit Number 00JE0009L, was issued in March 2000 and is a site-wide permit for the emission of particulates associated with land development. The STM site has developed a fugitive dust plan for land development that addresses measures to be taken during construction activities.

The emissions threshold for major source designation under Title V of the Air Quality Act is 100 TPY. No sources at the STM site approach this threshold. Operating permits may be issued for sources with threshold under 100 TPY and are called minor sources. NREL currently is not required to obtain a minor source operating permit.

3.4 NOISE

Noise is defined as unwanted or annoying sound that is typically associated with human activities and that interferes with or disrupts normal activities (Salter, 2000). Sound and noise are measured as sound pressure levels in units of decibels (dB). Response to noise varies according to its type, its perceived importance, its appropriateness in the setting and time of day, and the sensitivity of the individual receptor. Human hearing is simulated by measurements in the A-weighting (dBA) network, which de-emphasizes lower frequency sounds to simulate the response of the human ear. Some typical sound levels from common noise sources are presented in Table 3-3.

Table 3-3. Sound Levels* of Typical Noise Sources and Noise Environments (A-Weighted Sound Levels).

Noise Source (at a given distance)	Scale of A-weighted Sound Level (dBA)	Noise Environment (equivalent)	Human Judgment of Noise Loudness (relative to a reference loudness of 70 dB*)
Commercial jet take-off (200 feet/60.6 meters)	120	--	Threshold of pain *32 times as loud
Motorcycle (25 feet/7.6 meters) Diesel truck, 40 mph (50 feet/15.2 meters)	90	Boiler room; Printing press plant	*4 times as loud
Garbage disposal (3 feet/1 meter)	80	Noisy urban daytime	*2 times as loud
Bus idling (50 feet/15.2 meters)	75	--	*1.5 times as loud
Passenger car, 65 mph (25 feet/7.6 meters) Vacuum cleaner (3 feet/1 meter)	70	--	Moderately loud *70 dB (Reference loudness)
Normal conversation (5 feet/1.5 meters)	60	Data processing center; Department store	*1/2 as loud
Light traffic (100 feet/30 meters)	50	Quiet urban daytime	*1/4 as loud
Bird calls (distant)	40	Quiet urban nighttime/rural	Quiet *1/8 as loud
Library	36	Quiet suburban nighttime	Quiet *3/32 as loud

*These values are logarithmic measurements (i.e., every 10-dBA increase is perceived by the human ear as approximately twice the previous noise level; therefore, the motorcycle is twice as loud as the garbage disposal).

Source: FHWA and Salter, 2000.

3.4.1 Sensitive Receptors

Noise receptors located in the immediate vicinity of the STM site include STM personnel, inhabitants of residences to the east and south of the site boundary, and wildlife. The relationship between noise and wildlife is discussed in Section 4.8.

With respect to NREL personnel, DOE has accepted the Occupational Health and Safety Administration (OSHA) noise regulations and guidelines for worker exposure and manages compliance with them. These regulations and guidelines focus on noise from machinery, equipment and tools. NREL maintains compliance with all regulations related to worker health and safety.

Other sensitive receptors in the vicinity include multifamily residences located approximately 50 feet (15.2 meters) east of the east site boundary. Two subdivisions composed of single-family residences are located south of the STM site. The nearest residence to the site's southwestern boundary is located approximately 50 feet (15.2 meters) away. The nearest residence to the site's southeastern boundary is located approximately 100 feet (30.4 meters) away. There are no schools, hospitals, churches or daycare centers in the area. A park with ball fields is planned in the open area immediately south of the STM site.

3.4.2 Existing Noise Levels and Sources

The ambient noise level within the STM site consists of sounds generated by vehicle traffic, various activities on the site, and natural sources. Actual noise levels in and around the site are affected by specific noise events, intervening topography, vegetation, and meteorological conditions, including wind speed and direction.

Although noise measurements were not taken and noise modeling was not performed, site observations indicate the acoustic environment within the boundaries of the southeastern portion of the site can be considered similar to that of an urban location. Both sites are located near I-70, a significant noise source throughout the day and during sensitive late night and early morning periods. Noise levels on the mesa top are typical of a rural location, but can be elevated substantially when the adjacent State Highway Patrol's driver-training track is being used. It is estimated that 24-hour day-night average sound levels on the site typically range from 40 to 60 dBA. Most activity and mechanical operations at the STM site are conducted within buildings. Construction activity and routine maintenance are occasional noise sources. In the future, the new park will become another source of noise in the vicinity.

In general, roadway noise depends upon vehicle type, speed, traffic volume, surface conditions, surface gradient, and distance to receptors. On-site light vehicle traffic contributes little to overall traffic noise at off-site locations because of the limited number of vehicles that access the site, relatively low speed limits throughout the site, and relatively high ambient noise levels near most sensitive receptors (adjacent residences).

I-70 runs east-west approximately 1,400 feet (424 meters) south of the STM site's southeastern boundary. Based on site visits, I-70 is the primary ambient noise source for the southern portion of the STM site. Passenger cars moving at 65 mph can generate noise measured at 70 dBA, measured at 25 feet (15.2 meters) (see Table 3-3).

A RTD bus route serves the site, which contributes to temporary noise levels. Buses use the main access road to the site and turn around just east of the site's security building. Idling buses generate a temporary noise level of approximately 75 dB at 50 feet (15.2 meters) (see Table 3-3). The bus line serving the STM site and downtown Denver operates between 5:16 a.m. and 6:10 p.m. on weekdays. During the morning and evening peak commuter periods, buses stop at the Visitor Center approximately every half hour (RTD, 2002).

3.4.3 Regulations and Guidelines

Environmental noise regulations and guidelines for outdoor, neighborhood, and/or community noise levels have been promulgated by the EPA, the Federal Highways Administration (FHWA), the State of Colorado, and local governments such as the City of Denver. Although these standards are not directly applicable to the STM site, they provide a general context for assessing noise issues. No local regulations apply to the STM site.

The EPA provides guideline noise levels for anticipated noise/human activity disturbance impacts in relation to industrial construction and operations. The levels are set to define a point at which these levels and lower levels would protect people from activity interference and annoyance. Outdoor locations "in which quiet is a basis for use" are assigned a maximum noise level of 55 dBA. Indoor locations are assigned a maximum noise level of 45 dBA.

The DOE has accepted the OSHA noise regulations and guidelines for worker exposure and NREL operates in compliance with them. These regulations and guidelines focus on noise from machinery, equipment and tools.

The FHWA has created Noise Abatement Criteria for actions that involve federal roads. A noise level of 67 dBA is assigned to lands that include residences, schools, churches, hospitals, picnic areas, and recreation areas. A 24-hour average level, weighted to address the increased significance of nighttime noise, of 67 dBA is a typical threshold for considering mitigation for residential sensitive receptor exposure.

Although the State of Colorado Noise Statute (Code of Colorado Regulations (CCR) 25-12-101 though CCR 25-12-109) has established statewide standards for noise level limits for various time periods and areas, the standards exclude federal entities such as NREL; however, they can be used as guidelines in order to evaluate impacts. The most stringent permissible noise levels apply to residential zones, where the maximum permissible daytime (7:00 a.m. to 7:00 p.m.) noise level is 55 dBA and the noise level is measured at a distance of 25 feet (7.6 meters) from the property line. In addition, construction projects are limited to permit conditions or 80 dBA for the period within which the construction is to be completed or reasonable amount of time.

The City of Denver has promulgated a noise ordinance, Revised Municipal Code, City and County of Denver, Colorado, Ordinance No. 628-97, 22 September 1997, Supplement No. 55, (City and County of Denver, 1997) that can provide another basis for evaluating noise levels. The type of premises on which the noise is generated determines allowable noise levels. In the case of the STM site, the most conservative approach is to consider it an "industrial premises." The maximum allowable sound pressure level under the Denver ordinance is 80 dBA measured at the site property line between the hours of 7:00 a.m. and 10:00 p.m.

3.5 VISUAL QUALITY/AESTHETICS

The emphasis of the following discussion is on the STM site because NREL's operations at the DWOP are contained within leased building space and NREL's Proposed Action would not involve any substantial exterior changes to privately owned/leased DWOP buildings.

3.5.1 Visual Characteristics of the Project Site and Vicinity

Figure 3.5, photographs 1 through 11, characterize existing visual and aesthetic conditions of the STM and DWOP sites and vicinity from key vantage points. These photographs are presented at the end of Chapter 3 and are referenced throughout Chapter 3, where appropriate.

The visual characteristics of the STM site are created by permanent facilities, temporary facilities and natural conditions (see Figure 3.5, photographs 1-11). The permanent facilities are primarily composed of buildings, roads, parking areas and test sites. The temporary facilities include certain outdoor research devices and site operations and maintenance equipment. Modern office buildings and a mature and well-developed formal landscape characterize the DWOP site.

The dominant visual characteristics of the existing STM site include the prominent slope and mesa top associated with South Table Mountain, the NREL facilities located on top of South Table Mountain, the SERF, the FTLB, and the Visitor Center located at the toe of the slope. The STM site buildings are prominent against the landscape of South Table Mountain.

The STM site facilities are designed to reflect the laboratory activities related to modern energy concepts. Two of the larger buildings, the SERF and FTLB, are terraced and set against the south slope of South Table Mountain. In addition to the buildings at the STM site, NREL has constructed a variety of solar testing and measurement structures, such as the High Flux Solar Furnace, Solar Radiation Research Laboratory, and numerous PVs situated throughout the site.

The facilities located on top of South Table Mountain cover a small proportion of the overall South Table Mountain mesa top (see Figures 1.2 and 1.3). The remainder of the mesa top is almost entirely undeveloped and part of the conservation area delineated by Zone 2. NREL's solar furnace and the surrounding buildings in Zone 1 are visible from off-site locations. A Colorado State Patrol driver training track facility is also located on top of the Mesa, but it is not visible from most off-site locations. Other natural areas on the mesa top are within designated Jefferson County open space areas or NREL's on-site conservation area (Zone 2).

The visual character of the project vicinity is defined primarily by commercial and residential development (see Figure 3.5, photos 9, 10, and 11).

Night lighting and visibility from off-site locations, especially light from the mesa top (Zone 1) have been the subject of community concern about light pollution. Light pollution generally refers to the cumulative glow that urban and suburban areas typically generate at night as they increase in density. It can also refer to incidental light sources in locations where lighting is not welcome.

Exterior lighting in Zone 1 is limited and does not include area-wide lighting typical of local streets or parking areas. Recently, motion sensors have been installed to minimize the duration that these exterior lights are on and visible from off-site locations. No lighting is currently

provided in Zones 2 and 6. Exterior night lighting is provided in Zones 3, 4, and 5 to address site and worker security. Additional light from within buildings is also present at night and is visible from off-site locations.

3.5.2 Public Vantage Points and Site Visibility

There are several primary off-site public and private vantage points in the project vicinity where the site and/or site facilities are visible. The following discussions clarify the locations of these vantage points and characterize the views from these locations.

Vantage points along U.S. Highway 6 exist for east and westbound motorists west of the U.S. Highway 6/I-70 interchange (see Figure 3.5, photograph 9). Only the larger buildings at the STM site can be readily identified by a passing motorist. Occasionally, the mesa top facilities can be viewed from these vantage points.

Vantage points also exist along I-70 for motorists heading northeast toward DWOP. The STM site's larger buildings are at eye level of passing motorists. Facilities on the mesa top can be seen, although not by the casual observer. Existing development, foliage, and overhead transmission lines obscure views from vantage points to the west of the STM site looking east or northeast.

Numerous vantage points exist within the neighborhoods and commercial areas on the west, south, and east sides of the STM site (see Figure 3-5, photographs 5-11). The Pleasant View residential neighborhood is located immediately south of the NREL property line and immediately adjacent to the west and east boundaries of Zone 2. As shown in Figure 3-5 photographs 5-8, neighbors in this area have views of Zones 2, 3, 4, 5, and 6 and limited views of Zone 1.

Signs on the chain link fence (see Figure 3-5 photograph 5) indicate that some portion of the area south of Zone 6 is part of the Jefferson County Open Space program. A park with ball fields, including one lighted ball field, is planned for the southern portion of this off-site property. In the future, this lighted ball field will add new sources of light in the area.

Residents in the immediate vicinity, with homes on roads near the STM site boundary, have the most direct views of the STM site (see Figure 3-5, photographs 5 and 6). Most homes and roads within the Pleasant View neighborhood do not have views of the STM site due to topography and landscape obstructions.

Residents of the far western units in the condominiums at Camden Denver West have a view across the eastern edge of the STM site, including the mesa top facilities (see Figure 3-5 photograph 8). Views of the foothills west of Golden and Lakewood are unobstructed.

The Estates at 6th Avenue, a residential neighborhood, is located approximately one mile (1.6 kilometers) south of the STM site, south of U.S. Highway 6. This location allows for distant views of the entire NREL site (all zones) and the mesa top facilities (see Figure 3-5, photographs 9, 10, and 11).

3.5.3 Public Sensitivities Associated with Visual Quality and South Table Mountain

Although federal agencies and sites are not subject to the policies and regulations of local governments, NREL considers them during site planning and development efforts. The following discussion summarizes local policy related to visual quality and South Table Mountain.

Local policies established by Jefferson County, Golden, and Lakewood reflect community sensitivity with respect to the visual qualities provided by natural resources in the area such as South Table Mountain. Specifically, the *Jefferson County General Land Use Plan* (Land Use Plan) characterizes North and South Table Mountain as "unique landscapes," and states that "maintaining landscapes that have a unique visual quality" is a key to maintaining the quality of life in Jefferson County. According to the Land Use Plan, suitable land uses for unique landscapes such as South Table Mountain are limited to rural residential and county, regional, and conservation open space uses (Jefferson County, 1986).

Sensitivity to the development of South Table Mountain was also reflected by responses to the project's scoping letter. The responses to the scoping letter are presented in Appendix B. The key issues raised in the scoping response letters follow.

- "Current local land use plans, visions, and authorities disfavor developments on the top or upper slopes of the Table Mountains."
- "Any further developments high on the slopes and on the mesa top may set land use precedents that could lead to further developments on the higher slopes and top by other land owners."
- New development, especially on the mesa top, would increase site visibility impacts and light pollution.

The predominant view expressed by the scoping response letters that were received reflects general and specific opposition to existing and future development of the mesa tops and slopes, especially night lighting.

3.6 WATER RESOURCES

3.6.1 Surface Water

The STM site is located between Lena Gulch and Clear Creek (see Figure 1-2). Lena Gulch is approximately one-quarter mile (0.2 kilometers) to the south of the STM site, and Clear Creek is located north of South Table Mountain. Lena Gulch flows northeastward into Clear Creek. A 100-year floodplain associated with Lena Gulch has been delineated on the grounds of Camp George West south of the STM site. Future improvements associated with the Camp George West Park include measures to reduce a channel constriction associated with this floodplain.

There are no perennial creeks, streams, ponds, or floodplains on the STM site. Surface water, when present, is not used for any purpose on or off the site. There may be seasonal seeps on the STM site after small amounts of surface water percolate through the soil or the fractured basalt that caps South Table Mountain. Intermittent storms and other seasonal precipitation events may cause water to temporarily collect in topographic lows and drainages. Surface

water may briefly collect in depressions formed in the basalt on the top of the mountain (NREL (ERO), 1998). Wetlands and related issues are discussed in Sections 3.8 and 4.8 of this EA.

The general slope of the STM site is toward the south/southeast, directing stormwater toward Lena Gulch both from the top of South Table Mountain and the property below. Two primary drainages collect runoff from the top of South Table Mountain within the STM site's boundary. These drainages, as well as another drainage located just west of the site's west boundary, occasionally convey stormwater (as shown on Figure 3-9 and discussed in Section 3.8.2).

According to the 1993 Baseline Surface Water Monitoring Program, the STM site is divided into 14 hydrologic basins. The 1993 Program computed drainage basin characteristics including surface runoff rates and volumes, which were based on the drainage patterns, flow lengths, slope, precipitation amounts, soil types, and vegetative cover. The rate of water erosion and the transport of soil and rock on site and in the vicinity were determined to be generally low because most of the STM site is undeveloped.

Most of the development on the STM site is located on the southern portion of the site below the slopes of South Table Mountain. A portion of the site's stormwater is directed through engineered drainage structures designed to control runoff. The structures include earth and concrete drainage channels, which effectively direct stormwater to a detention basin near the southeastern corner of the STM site and through a 4.5-foot diameter storm sewer drain to Lena Gulch.

Background surface water quality data were gathered from five sample locations on the STM site after storms produced sufficient runoff during 1992 and 1993. An evaluation of the analytical data determined that there were no permanent, detectable impacts to surface water quality down gradient from the STM site from STM activities. Slight elevations of total suspended solids, oil and grease, and oxygen demand in the stormwater were attributed to site construction occurring during the study (NREL, 1994).

Although NREL is not required to obtain a National Pollutant Discharge Elimination System (NPDES) permit for routine operations at the STM and DWOP sites (NREL, 1994), a stormwater permit is necessary for construction activities. The EPA administers stormwater permits for federal facilities in the State of Colorado. Based on EPA's recent site inspection and guidance to NREL, no permit is required under Phase II of the stormwater rule (MS4). NREL implements a program that identifies procedures to minimize impacts to surface waters resulting from construction activities. The procedures are detailed in NREL's "Stormwater Pollution Prevention Program for Construction Activities."

As a result of an inspection by the Colorado Department of Health, the EPA investigated two waste disposal sites on the grounds of Camp George West near the STM site during the late 1980s and early 1990s for possible contributions to the contamination of groundwater and surface water in Lena Gulch. The State of Colorado Department of Military Affairs owned the waste disposal sites. One site was located along an ephemeral tributary to Lena Gulch north of the STM site on the top of South Table Mountain. The other was located south of the STM site in the vicinity of Zone 6. This site lies in the vicinity of the current southern boundary of the STM site. Samples taken during the investigation of materials remaining at the waste sites indicated that the materials were nonhazardous. By 1993, all sources of contamination were removed; however, surface water samples indicated the presence of a small amount of pesticides in the

tributary. The pesticides were not present in the water by the time it entered Lena Gulch. There was no evidence that the pesticides were associated with the waste materials at the northern site. Soil samples taken following source removal indicated the presence of metals in the soils associated with the actual disposal areas. The study concluded that although metals were present in small amounts, there would be no impacts to local residents or users of the area. Groundwater samples were not taken because sources of local drinking water would not be affected (Morrison Knudsen, 1993).

The DWOP site is located in a fully developed area of office buildings. The office park owner has developed stormwater management structures that are approved by Jefferson County. NREL has no responsibility for the management of stormwater.

3.6.2 Groundwater

Precipitation and snowmelt are the primary sources of groundwater recharge in the uppermost geologic units that are present beneath the STM and DWOP sites. Site development is constructed on alluvial/colluvial sands and gravels. Beneath it, the Denver Formation consists of interbedded sandstone, mudstone, and claystone. Both geologic units contain groundwater. Groundwater sometimes manifests itself in perched water tables within the Denver Formation. In general, water in the Denver aquifer meets drinking water standards for public water supplies in most of the area. The STM site, however, is located near the edge of the aquifer, where water of poorer quality exists due to the proximity of pollution sources at the surface and less water available for dilution. The sources of pollution are non-specific and contribute to higher measurements of total dissolved solids. In general, the closer a formation is to the surface, the more likely that foreign materials or pollutants could infiltrate into the formation and in greater quantities, thus degrading water quality in the near-surface. Groundwater flow mimics surface water flow and trends toward the southeast. The gradient of flow is estimated at 0.06 feet per foot. The rate of flow is estimated at 0.05 feet per day, assuming that the effective porosity of the Denver Formation ranges from 12.9 to 31.1 percent (Handex, 1997).

Groundwater monitoring is not required of NREL by a regulatory agency (NREL, 1993); however, monitoring wells were installed at the STM site, and groundwater baseline data were accumulated beginning in 1990. Groundwater monitoring was performed quarterly under the direction of NREL during 1991 and annually during the years 1992 through 1994. The most recent groundwater monitoring data were obtained in 1997. In 1997, groundwater beneath the site was analyzed for VOCs, semi-volatile organic compounds (SVOCs), total metals, pesticides, and herbicides. Results of the analysis indicated that the groundwater beneath STM is uncontaminated for VOCs, SVOCs, pesticides, and herbicides. Although the samples indicated that concentrations of manganese and iron exceeded drinking water standards, the measurements fell within naturally occurring variations.

Activities at DWOP are indoors and do not have the potential to negatively impact groundwater. The owner of DWOP conducted a groundwater survey that concluded that the water beneath DWOP is not contaminated (NREL, 1993).

3.7 GEOLOGY AND SOILS

3.7.1 Geology

The STM and DWOP sites are located on the gently sloping terrain of the Foothills Province of the Rocky Mountain Front Range between the Southern Rocky Mountain Province to the west and Great Plains Province to the east. The Front Range trends north-south, with lower elevations of approximately 5,000 feet (1,515 meters) and higher elevations ranging from 9,800 feet (2,969 meters) to over 13,000 feet (3,939 meters) along the Continental Divide, approximately 16 miles (25.8 kilometers) west of the site. The sites are located on the western edge of the Denver Basin, an asymmetrical, north-south trending syncline with a steeply dipping western limb and a shallowly dipping eastern limb. The Golden Fault separates the Front Range to the west from the Denver Basin to the east. The Denver Basin proper contains more than 9,840 feet (2,982 meters) of Pennsylvanian to Cretaceous sedimentary deposits.

The sites are located in the Great Plains Tectonic Province in an area of low seismicity. The trace of the Golden Fault lies approximately 2.1 miles (12.81 kilometers) west of the STM site. It is a west dipping, reverse fault that strikes north-northwest and is apparently several hundred years old. Although the Colorado Geological Survey (CGS) considers the fault "active," the most recent movement on the fault is estimated to have occurred approximately 200,000 years ago, producing approximately 48 feet (14.5 meters) of displacement. During the period 1870 through 1979, earthquakes of magnitude up to 5.9 have been recorded in the Golden vicinity. Historically, however, the region has not been very seismically active (Bukovanshy Associates Ltd., 1996).

To the west of the Golden Fault and directly west of the STM site lay Precambrian (older than 600 million years) gneisses, schists, and quartzites of the Idaho Springs Formation and the Paleozoic (225 to 600 million years old) sandstones and mudstones of the Fountain Formation. To the east of the Golden Fault lay the Cretaceous (70 to 135 million years old) sandstones and shales of the Pierre, Fox Hills, Laramie, Arapahoe, and Denver Formations. These sediments have been upturned, and in some cases overturned, by the thrust motion of the fault (Van Horn, 1976). The STM and DWOP sites are underlain by the Denver Formation, a loosely cemented, tuffaceous sandstone, silty claystone interbedded with some conglomerate. Based on drilling done for hydrogeologic characterization, bedrock can range from zero to 35 feet (11 meters) below the surface (NREL, 1993).

Figure 3-6 illustrates the geologic cross section beneath the STM site.

The STM site area is situated on the top and south-facing slopes of South Table Mountain, a prominent local landmark consisting of flat lying, poorly cemented sedimentary rocks capped with Tertiary (two to 70 million years old) basalt lava flows. Three distinct lava flows exist. The thickness of these flows varies and is approximately 150 feet (45 meters) in some locations. The mesa top of South Table Mountain slopes gently to the south. The elevation of the site ranges from approximately 5,780 feet (1,752 meters) above sea level at the base of South Table Mountain to 6,030 feet (1828 meters) at the top of the mesa. Unconsolidated alluvial sediments associated with the Lena Creek drainage, which flows easterly approximately 1,450 feet (439 meters) south of the STM site, underlie the STM site. The DWOP buildings are located to the southeast and east of the STM site, up to one mile (1.2 kilometers) away.

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Figure 3-6. Geologic Cross Section (West-East) Beneath the STM Site.

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The sites are located in a Jefferson County "Designated Dipping Bedrock Area," where steeply dipping beds of expansive claystone bedrock are found near the ground surface. When exposed to water, layers of bedrock display different potentials for expansion, resulting in damage to roads and lightly loaded structures. Natural alluvial deposits may reduce the heaving potential of the bedrock at the site. Landslides and other mass earth movements can occur as shallow features where slopes are steep. A geologic hazards evaluation associated with construction of a natural gas pipeline in the vicinity of the STM site indicated that slopes on the south side of South Table Mountain may be unstable. There is, however, no evidence of landslides (Bukovanshy Associates Ltd., 1996).

3.7.2 Soils

Denver clay loam and the Denver cobbly clay loam dominate the soils at the DWOP and the portion of the STM site where most of the development is located (slopes of less than 9 percent). The properties of these soils differ by the greater amount of rock fragments occurring in the latter soil. Rock fragments comprise 0 to 35 percent of the total volume. The soils are deep, well-drained soils that occur on high terraces, hill slopes, and fans. They are formed in calcareous, cobbly, clayey material derived predominantly from mudstone and shale. Permeability is slow, and the available water capacity is high. Runoff rates are characterized as medium. The effective rooting depth is approximately 60 inches. Water erosion and soil blowing are moderate hazards. The shrink-swell potential is high. These soils are used mainly for grazing and recreation areas. They can also be used for crops and community development. The soil is limited for community development by the shrink-swell potential, low strength, and slow permeability, but this condition can be addressed with various construction techniques (Soil Conservation Service, 1980).

The Leyden-Standley-Primen cobbly clay loams and Leyden-Primen-Standley extremely stony clay loams dominate the soils that occur on the slopes of South Table Mountain. Immediately east of the Leyden-Standley-Primen cobbly clay loams is a smaller area of Standley-Leyden-Primen very stoney clay loams. The properties of these soils differ by the amount of rock fragments present and the relative amounts of individual components. Rock fragments comprise up to 35 percent of the total volume. The Leyden-Standley-Primen cobbly clay loams are located on the westernmost slopes within the STM site, occurring on slopes that range from 9 to 15 percent. The Leyden-Primen-Standley extremely stony clay loams are located on the easternmost slopes within the STM site, occurring on slopes that range from 30 to 70 percent. The Standley-Leyden-Primen very stoney clay loams occur on slopes that range from 15 to 30 percent. The Leyden and Standley components of these soils are deep to moderately deep and are well drained. They are formed in calcareous, cobbly, gravelly, and clayey material derived from mixed sources. Permeability is slow, and water capacity is low. The effective rooting depth is 20 to 60 inches. Runoff is rapid, and water erosion is a severe hazard. Soil blowing is a slight hazard. The shrink-swell potential is moderate to high. The Primen component is shallow and well drained. It formed in cobbly, stony, gravelly, and clayey material derived from mixed sources. Permeability is slow, and water capacity is low. The effective rooting depth is 10 to 20 inches. The soils are primarily used for grazing. The primary limitations to the use of the soil for building construction are the slope, depth to bedrock, soil slippage, the shrink-swell potential, large stones, and low strength (Soil Conservation Service, 1980).

The Lavina loam covers the top of South Table Mountain. It is a shallow, well-drained soil formed in calcareous, clayey alluvium and loess deposited over hard volcanic rock. Small areas of volcanic rock make up five to ten percent of the surface. Rock fragments comprise up to 15

percent of the volume. Permeability of this soil is low, and water capacity is low. The effective rooting depth is 10 to 20 inches. Runoff is slow, and water erosion is a slight hazard. Soil blowing is a slight hazard. The shrink-swell potential is moderate to high. This soil is used mainly for grazing and for recreation areas and areas for wildlife. The main limitations to using the Lavina loam for building construction are its shallowness to rock and the shrink-swell potential (Soil Conservation Service, 1980).

Figure 3.7 illustrates the locations of the soils found on the STM and DWOP sites.

3.8 BIOLOGICAL RESOURCES

The following section provides a description of the biological resources found at the STM project site. The DWOP site involves leased interior space; therefore no land area or biological resources would be affected by the proposed action.

The following discussion is presented in four sections: vegetation, which includes noxious weeds; wetlands; wildlife; and species of concern. This evaluation primarily relies upon previous reporting and fieldwork performed by various consultants at the STM site over the past 16 years, as well as fieldwork conducted in May 2002. Additional detail is available in the following reports:

- *South Table Mountain Vegetation Survey* (NREL (Plantae), 2002);
- *National Renewable Energy Laboratory (NREL) Site Conservation Easement Baseline Inventory* (NREL (Dames & Moore), 1999); and
- *South Table Mountain Conservation Easement Baseline Inventory* (NREL (ERO), 1998)

Located at the base of the foothills to the Rocky Mountains, the STM site occurs at elevations ranging from 5,780 (1,752 meters) to 6,030 (1827 meters) feet above mean sea level. This coincides with the interface between two ecological provinces: the Great Plains-Palouse Dry Steppe Province to the east, and the Southern Rocky Mountain Steppe – Open Woodland – Coniferous Forest – Alpine Meadow Province to the west (Bailey, 1995).

3.8.1 Vegetation

Within the STM site project area three primary plant communities occur: grasslands, shrublands, and wetlands. Table 3-4 lists the vegetation types and their areal extent. Figure 3.8 depicts the locations of these different vegetation types. Noxious weeds occur in all vegetation types and are discussed in subsection of 3.8.1. Wetlands are a special type of habitat and are discussed in the wetlands subsection. Botanical names follow Weber and Whitman (1996).

Grasslands
Grasslands make up the majority of the land area (285.61 acres) (see Table 3-6) at STM and comprise 79 percent of the total land area. These grasslands can be further divided into two subclassifications: shortgrass prairie and mixed-grass prairie (NREL (Plantae), 2002). Although each of these grassland types is composed of the same 125 species, differences in their spatial distribution and the relative dominance of the plant species is significant enough to warrant their separation (NREL (Plantae), 2002). The shortgrass community occurs on the mesa top of South Table Mountain and is dominated primarily by blue grama (*Chondrosum gracile*) and

Figure 3-7. Soils Types at the STM and DWOP Sites (Soil Conservation Service 1980)

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INSERT FIGURE 3-8 (Vegetation Map) HERE

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cheatgrass (*Anisantha tectorum*) (NREL (Plantae), 2002). The mixed-grass community occurs on the side-slopes and at the toe of South Table Mountain and is dominated by needle-and-thread grass (*Hesperostipa comata*) and western wheatgrass (P*ascopyrum smithii*). Though not dominant, other prominent species found in both types of grasslands include yucca (*Yucca glauca*), rubber rabbitbrush (*Chrysothamnus nauseosus spp. graveolens*), and prickly pear (*Optunia spp.*). Disturbed areas occur adjacent to buildings, roads, and parking lots. These areas have been revegetated and support a combination of grasses such as smooth brome (*Bromopsis inerme*) and crested wheatgrass (*Agropyron cristatum*), which are commonly found in revegetation seed mixes, as well as native grasses, and native and introduced weedy species (NREL (Plantae), 2002). Weeds are discussed in more detail in the *Noxious Weed* sub-section.

Table 3-4. Vegetation Types Occurring at the STM Site, Golden, Colorado

Vegetation Type	Area (acres)
Grassland	
Shortgrass prairie	**124**
Mixed-grass prairie	**103**
Disturbed/Reclaimed	**32**
Shrubland	
Tall shrublands	**19**
Short shrublands	**16**
Ravine shrublands	**5**
Wetlands	**<1**
Developed	**28**
Total	**327**

Shrublands

Shrublands occur at several locations within the STM site project area and comprise 13 percent (47.29 acres) of the total land area (see Table 3-6). Based on their location and dominant species composition, these shrublands have been divided into three sub-classifications: tall shrublands, short shrublands, and ravine shrublands (NREL (Plantae), 2002). Fifty-two plant species were documented as occurring within the tall and short shrubland community types. Tall shrublands occur along the rim of the mesa, usually where volcanic cap rock is exposed and are dominated primarily by mountain mahogany (*Cercocarpus montanus*) (NREL (Plantae), 2002). Short shrublands occur either on slightly elevated flat areas within grasslands and dominated by rubber rabbitbrush, or as skunkbush (*Rhus aromatica ssp. trilobata*) dominated areas along the upper slopes below the mesa rim (NREL (Plantae), 2002).

Due to their locations within swales and drainages on the upper to mid-slopes of South Table Mountain, ravine shrublands are more mesic (requiring a moderate amount of moisture) than the surrounding landscape, and contain a higher diversity of plant species than the other shrubland types. Ravine shrublands have also been called riparian (located on the bank of a natural watercourse) areas in other documents written about the STM site project. A total of 122 plant species were documented within ravine shrublands (NREL (Plantae), 2002). Shrubs that dominate these areas include chokecherry (*Padus virginiana*), wild plum (*Prunus americana*), skunkbush *(*Rhus aromatica *var.* trilobata*),* and Wood's rose *(Rosa woodsii) (*NREL (Plantae), 2002). One or two large cottonwood trees *(Populus deltoides)* and/or peach-leaved

willow trees (*Salix amygdaloides*) are commonly found in the upper portions of these drainages. Wetlands occur as small isolated pockets in the ravines and are described in Section 3.8.2 Wetlands.

Noxious Weeds

Noxious weeds occur within each of the plant communities described in Section 3.8.1. Invasive species, including noxious weeds, are regulated on federal lands by the February 3, 1999 EO 13112 "Invasive Species" and the Plant Protection Act of 2000, which mandate their control, and if possible, their eradication. Invasive species are defined as "alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health." Noxious weeds are invasive species that have been designated by rule (i.e. state, county, municipality, etc.) as being noxious, and meet one or more of the following criteria: 1) aggressively invades or is detrimental to economic crops or native plant communities, 2) is poisonous to livestock, 3) is a carrier of detrimental insects, diseases, or parasites, and/or 4) the direct or indirect effect of the presence of this plant is detrimental to natural ecosystems or agricultural areas (CNAP, et al., 2000). In Colorado the Colorado Weed Management Act, Title 35, Article 5.5, enables counties and municipalities to mandate noxious weed management by public and private landowners. There are 68 noxious weed species that have been identified as being the most problematic in Colorado, 10 of which have been prioritized for immediate action due to their widespread economic impact to the State.

At the STM site, 20 plant species found on the State of Colorado Noxious Weed List were identified (NREL (Dames & Moore), 1999; NREL (Plantae), 2002). These species are listed in Table 3-5. Of these 20 species, five are found on the State's top ten-priority list, and six are found on Jefferson County's list of noxious weeds of concern.

Table 3-5. Noxious Weed Species Occurring at the National Renewable Energy Laboratory – South Table Mountain Site, Golden, Colorado

Common Name	Botanical Name
Canada thistle*[1]	*Breea arvense (Cirsium arvense)*
Chicory	*Cichorium intybus*
Common burdock	*Arctium minus*
Common mullein	*Verbascum thapsus*
Common teasel[1]	*Dipsacus fullonum*
Dalmatian toadflax[1]	*Linaria dalmatica*
Diffuse knapweed*[1]	*Acosta diffusa (Centaurea diffusa)*
Cheatgrass (Downy brome)	*Anisantha tectorum (Bromus tectorum)*
Field bindweed*	*Convolvulus arvensis*
Flixweed	*Descurainia sophia*
Houndstongue[1]	*Cynoglossum officinale*
Jointed goatgrass*	*Aegilops cylindrica*
Kochia	*Bassia sieversiana (Kochia scoparia)*
Musk thistle*[1]	*Carduus nutans*
Myrtle spurge	*Euphorbia myrsinites*
Oxeye daisy	*Chrysanthemum leucanthemum*
Poison hemlock	*Conium maculatum*
Puncturevine	*Tribulus terrestris*

Table 3-5. Noxious Weed Species Occurring at the National Renewable Energy Laboratory – South Table Mountain Site, Golden, Colorado

Common Name	Botanical Name
Redstem filaree	*Erodium cicutarium*
Russian thistle	*Salsola iberica*

*Found on the top ten priority list for noxious weed control in the State of Colorado.
[1]Found on the noxious weed list for Jefferson County.
Source: NREL (Dames & Moore), 1999, and NREL (Plantae), 2002.

The most commonly encountered noxious weeds within the NREL STM project area are cheatgrass, diffuse knapweed (*Acosta diffusa*) (19.2 acres), Canada thistle (*Breea arvense*) (15.2 acres), Dalmatian toadflax (*Linaria dalmatica*) (17.1 acres), and houndstongue (*Cynoglossum officinale*) (NREL (Plantae) 2002). Cheatgrass is a common component of grasslands and is dispersed throughout the site, especially on the mesa top. Diffuse knapweed is commonly found along roads and trails, and other areas of disturbance throughout the project area. Canada thistle is common in mesic areas such as drainages and also occurs on dry upland sites, and is especially prevalent in the drainage between the SERF and FTLB. Houndstongue is very common in almost all ravine bottoms.

3.8.2 Wetlands and Other Waters of the U.S.

Wetlands are transitional zones between terrestrial and aquatic habitats. As described in the 1987 *Corps of Engineers Wetlands Delineation Manual,* wetlands are defined to be those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas (Environmental Laboratory, 1987). Jurisdictional wetlands are those that fulfill the three wetland criteria stated above and that come under the jurisdiction of the USACE in accordance with their authority under Section 404 of the Clean Water Act. The USACE's authority was recently limited by the January 9, 2001 U.S. Supreme Court decision on the *Solid Waste Agency of Northern Cook County (SWANNC) vs. the U.S. Army Corps of Engineers* (531 U.S. 159 (2001)) which limited federal authority to regulate certain isolated wetlands. The SWANNC decision eliminates Section 404 jurisdiction of isolated wetlands where the sole nexus of jurisdiction is the use or potential use of such wetlands as habitat by migratory birds that cross state lines. Currently, isolated waters that do not exhibit a surface hydrologic connection to the tributary system in a watershed are not considered to be jurisdictional. In addition, small wetlands that form in ditches due to runoff (e.g., STM-6) are typically not considered jurisdictional wetlands. Wetland STM-11 is likely the only jurisdictional wetland that occurs within the project area. Official jurisdictional determinations are made by the USACE.

Through their administration of Section 404 of the Clean Water Act, the USACE have jurisdiction over all waters of the U.S., of which wetlands are one type, and rivers and streams are another. In compliance with Section 404 and EO 11900, "Protection of Wetlands," wetland surveys were performed by SAIC's wetland ecologist during the growing season of 2002. The routine wetland delineation methodology, as described in the 1987, USACE's *Wetlands Delineation Manual* (Environmental Laboratory 1987) was used. Wetlands are delineated using the simultaneous occurrence of three criteria: occurrence of at least 50 percent hydrophytic vegetation, wetland hydrology, and hydric soils.

A site is generally considered to exhibit wetland hydrology if soil saturation occurs continuously for a minimum of five percent of the growing season within the upper 12 inches of the soil profile (Environmental Laboratory, 1987). The growing season at the STM site is estimated to begin on April 30th and end on October 9th (162 days). Therefore the minimum number of consecutive days required for wetland hydrology is eight days (USDA-NRCS, 1999). Primary (e.g., drainage patterns, soil saturation in upper 12 inches of soil profile) and secondary (e.g., oxidized root channels, passage of the Fac-Neutral test) hydrologic indicators were used to determine wetland hydrology.

In the spring of 2002, soil pits were excavated on-site to a depth ranging from 12 to 16 inches, and soil horizons were described by thickness, texture, and color. Hydric soils were determined to be present where redoximorphic features were present. The Soil Conservation Service (SCS) did not identify any hydric soils at the STM site project (USDA-SCS, 1980).
A total of six wetlands, totaling 2,800 sf (0.064 ac) were identified on the STM site (see Table 3-6). They occur in Zones 2, 4 and 5. Wetlands identified within the project area are depicted in Figure 3-9. Within the STM site project area wetlands occur as small pockets within natural and man-made drainages. These wetlands are classified as palustrine emergent or palustrine forested wetland types under the Cowardin et al. (1979) wetland classification system.

Table 3-6. Wetlands Found at the National Renewable Energy Laboratory, South Table Mountain Site, Golden, Colorado

Wetland Type	Wetland Designation	Approximate Area[1] Square Feet (Acres)	
Palustrine Scrub-shrub	STM-1	1,170	(0.03)
Palustrine Emergent	STM-2	345	(0.01)
Palustrine Emergent	STM-6	150	(<0.01)
Palustrine Emergent	STM-7	760	(0.02)
Palustrine Emergent	STM-10	95	(<0.01)
Palustrine Emergent	STM-11	280	(0.01)
Total Area		**2,800**	**(<0.10)**

[1]Wetlands were not land surveyed.

Palustrine Emergent Wetlands
As indicated in Table 3-6, five (1,630 sf (0.04 acres)) of the six wetlands on the STM site are palustrine emergent wetlands. Hydrophytic vegetation dominating these areas include cattails (*Typha latifolia*), Nebraska sedge (*Carex nebrascensis*), slender sedge (*Carex praegracilis*), and Canada thistle (*Breea arvense*). Wetlands STM-6 and STM-11 occur in man-made ditches.

Palustrine Scrub-shrub Wetland
One wetland (STM-1) was identified as being the palustrine forested wetland type. This wetland was the largest wetland (1,170 sf (0.03 acres) identified on the site and is dominated by peach-leaved willow (*Salix amygdaloides*), wiregrass (*Juncus arcticus*), Kentucky bluegrass (*Poa pratensis*), and mat muhly (*Muhlenbergia richardsonis).*

INSERT FIGURE 3-9 POTENTIAL WETLANDS MAP HERE

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Waters of the U.S. Other than Wetlands

Waters of the U.S. other than wetlands are defined as perennial or intermittent streams that exhibit a defined streambed and banks, and are classified as jurisdictional waters regulated by the USACE. Seven main drainages and several swales occur on the NREL STM site (see Figure 3-9). In most cases, these areas exhibit defined beds and banks only in the areas just below the mesa top, which contain steep gradient slopes. In areas with mid and low gradients, these same drainages and swales do not possess defined beds and banks, are well vegetated, and therefore are not considered jurisdictional waters of the U.S. In 1997 the USACE determined that one of the drainages (Drainage 4) was not considered a water of the U.S. (Corps File #199780047).

3.8.3 Wildlife

Wildlife habitat at the STM site is comprised of grasslands, shrublands, and wetlands. As described in the ERO Resources report, the Colorado Division of Wildlife has estimated that these habitats may support up to 14 species of reptiles, 36 mammal species, 82 bird species, and four amphibian species. However, due to the lack of aquatic sites, the presence of amphibians is unlikely. Table 3-7 lists wildlife species commonly found at the STM site. A resident population of mule deer inhabits the STM site in the vicinity of the abandoned amphitheater. One or two mature cottonwood trees are located in the upper sections of drainages 1, 3, 4, 5, and 7 and provide perching sites for raptors such as red-tailed hawks and owls.

Table 3-7. Common Wildlife Found at the National Renewable Energy Laboratory, South Table Mountain Site, Golden, Colorado

Mammals	
Coyote	*Canis latrans*
Deer mice	*Peromyscus maniculatus*
Desert cottontail	*Sylvilagus auduboni*
Gray fox	*Urocyon cinereoargenteus*
Mexican woodrat	*Neotoma mexicana*
Mountain cottontail	*Sylvilagus nuttalli*
Mule deer	*Odocoileus hemionus*
Prairie vole	*Microtus ochrogaster*
Red fox	*Vulpes vulpes*
Birds	
American goldfinch	*Carduelis tristis*
American robin	*Turdus migratorius*
Black-billed magpie	*Pica pica*
Chipping sparrow	*Spizella passerina*
Dark-eyed junco	*Junco hyemalis*
European starling *	*Sturnus vulgaris*
Great Horned Owl	*Bubo virginianus*
Green-tailed towhee	*Pipilo chlourus*
Horned lark	*Eremophila alpestris*
MacGillivray's warbler	*Opoornis tolmiei*
Mourning dove	*Zenaida macroura*
Raven	*Corvus corax*

Red-tailed hawk	*Buteo jamaicensis*
Vesper sparrow	*Pooecetes gramineus*
Western bluebird	*Sialia mexicana*
Western meadowlark	*Sturnella neglecta*
Reptiles	
Bullsnake	*Pituophis catenifer*
Eastern fence lizard	*Sceloporous undulatus*
Plains garter snake	*Thamnophis radix*
Prairie rattlesnake	*Crotalus viridis*

Source: NREL (Dames & Moore), 1999, and NREL (ERO), 1998.
* This bird is not considered a migratory bird under the Migratory Bird Treaty Act (MBTA). The MBTA and related issues are discussed in detail in Section 3.8.5 and Table 3-9.

3.8.4 Species of Concern

The USFWS has identified eight species listed in accordance with the Endangered Species Act as threatened, endangered, or a candidate for listing, that could potentially occur within the STM site project area (Table 3-8). Of the State of Colorado's species of concern, eight species may potentially occur at the STM site (see Table 3-8). Because no open water exists within the project area, fish do not occur at the STM site.

Table 3-8. Threatened and Endangered Species, Candidates for Federal Listing, and State of Colorado Threatened, Endangered or Species of Concern Potentially Occurring at the STM Site.

Species	Status	Likely to Occur in Project Area
Birds		
American Peregrine Falcon (*Falco peregrinus*)	SSOC	Possible
Bald Eagle (*Haliaeetus leucocephalus*)	FT ST	Possible
Eskimo Curlew (*Numenius borealis*)	FE	Not likely
Ferruginous Hawk (*Buteo regalis*)	SSOC	Possible/Not likely
Mexican Spotted Owl (*Strix occidentalis lucida*)	FT ST	Not Likely
Mammals		
Black-Tailed Prairie Dog (*Cynomys ludovicianus*)	FC SSOC	Possible/Not likely
Canada Lynx (*Lynx canadensis*)	FT SE	Not Likely
Preble's Meadow Jumping Mouse (*Zapus hudsonius preblei*)	FT ST	Not likely
Amphibians		
Northern Leopard Frog (*Rana pipiens*)	SSOC	Not Likely
Insects		
Pawnee Montane Skipper (*Hesperla leonardus montana*)	FT	Not Likely
Flora		
Ute Ladies' Tresses Orchid (*Spiranthes diluvialis*)	FT	Not Likely
Colorado Butterfly Plant *(Gaura neomexicana ssp. coloradensis*)	FT	Not Likely

Abbreviations:
FT- Federal Threatened
FE – Federal Endangered
FC – Federal Candidate for Listing
ST – State Threatened
SE – State Endangered
SSOC – State Species of Concern
Source: NREL (Dames & Moore), 1999; and NREL (ERO) , 1998.

American Peregrine Falcon. Peregrine falcons nest on foothill and mountain cliffs from 4,500 feet (1,364 meters) to over 9,000 feet (2,727 meters), often above pinyon/juniper or ponderosa pine forests (Kingery, 1998). Peregrine falcons are documented in Jefferson County and may occur in the project area.

Bald Eagle. In the Denver area, bald eagle nests are located in large cottonwoods at the edge of reservoirs (Kingery, 1998). Bald eagles occur in a variety of habitats in Colorado including urban, riparian and agricultural areas. Significant numbers (472 in spring 1990) migrate annually along the edge of the Front Range foothills within two miles of the project area (Andrews and Righter, 1992). Bald eagles over-winter, migrate and summer in Colorado east of the Rocky Mountain Front Range, including eastern Jefferson County and the project area where aquatic habitats and terrestrial prey are available. Bald eagles are known to use habitat within Bear Creek Lake Park. Although no open water exists, their presence is possible within the STM site.

Eskimo Curlew. The Eskimo curlew was likely a spring migrant in Colorado, but is presumed extirpated from the State (Andrews and Righter, 1992).

Ferruginous Hawk. The ferruginous hawk nests in large expanses of lightly-grazed, shortgrass prairie, nesting in trees or on the ground (Ensign, 1983). Approximately 90 percent of their diet consists of medium-sized mammals (jackrabbits and cottontails west of the Continental Divide, and prairie dogs and ground squirrels east of the divide) (Kingery, 1998). Colorado's ferruginous hawks prey heavily on black-tailed prairie dogs, particularly in the winter (Kingery, 1998). Because of the ferruginous hawk's preference for black-tailed prairie dogs, their occurrence within the project area is possible, but unlikely, as there are no prairie dogs on the site.

Mexican Spotted Owl. Spotted owls in Colorado nest in older coniferous forests with complex vertical structure, sparsely forested canyons, and slickrock canyons in the southwest (Kingery, 1998). The Mexican spotted owl currently nests in two known locations in Colorado, Mesa Verde National Park, and the south-central mountains near the southern massif of Pikes Peak and the Wet Mountains (Kingery, 1998). Ideal breeding habitat does not exist within the project area, and no known active nest sites occur within Jefferson County.

Black-Tailed Prairie Dog. The black-tailed prairie dog exists in colonies in shortgrass or mixed prairie. They feed primarily on annual forbs, native grasses, and roots of forbs and grasses during late fall and winter. Site visits conducted by SAIC in 2002 did not observe any black-tailed prairie dogs or burrows at the STM site.

Canada Lynx. The distribution of lynx is tied to boreal forest, generally above 7,800 feet in Colorado and Utah (Koehler and Brittell, 1990). Lynx populations in the southern Rocky Mountains occur at the periphery of the species' range in North America, and lynx in Colorado

exist at low densities in fragmented distributions (Koehler and Aubry, 1994). Lynx in Colorado are rare even within suitable habitat. There is no suitable lynx habitat within the project area and therefore lynx presence is highly unlikely.

Preble's Meadow Jumping Mouse. The Preble's meadow jumping mouse (PMJM), a subspecies of the meadow jumping mouse (*Zapus hudsonius*) is known to occur only in portions of Colorado and Wyoming in moist lowlands with dense vegetation (USFWS, 1999; Fitzgerald, 1994). PMJM's habitat includes riparian corridors with diverse vegetation including shrubs such as willows (*Salix spp*.). Presence of the PMJM has not been confirmed within the STM site project area, and 1999 surveys at nearby Lena Gulch within Camp George West did not result in the successful capture of any PMJM. Lena Gulch represents the best potential habitat in the vicinity of the STM site. One factor that makes the presence of PMJM within the STM site unlikely is the absence of permanent sources of water.

Northern Leopard Frog. Water associated with ponds, streams, marshes, lakes, reservoirs, and beaver ponds and that have rooted vegetation is potential habitat for the northern leopard frog. No occurrences have been documented within the project area. Presence of the northern leopard frog is not likely due to the lack of water on the site.

Pawnee Montane Skipper Butterfly. The Pawnee montane skipper (skipper) butterfly occurs in Jefferson County, but only within the South Platte Canyon, centered on the town of Deckers, and not below 6,000 feet (1,818 meters) (USFWS, 1998). The skipper occurs in Ponderosa pine (*Pinus ponderosa*) woodlands with understories of blue grama and prairie gayfeather (*Liatris punctata*) (USFWS, 1998). The lack of suitable habitat and the limitations of its range make the occurrence of the skipper highly unlikely.

Ute Ladies' Tresses Orchid. Wetlands and areas adjacent to wetlands (within the geographic range of the project area) are potential habitat for the federally threatened Ute ladies' tresses orchid. Surveys to detect presence of the Ute ladies' tresses orchid in the STM site project area were negative, and no suitable habitat was found (NREL (Plantae), 2002).

Colorado Butterfly Plant. The Colorado butterfly plant is a species of concern within the project area (USFWS, 2002). Its known distribution is within Boulder, Douglas, Larimer, and Weld Counties (Spackman et al., 1997). This plant typically inhabits sub-irrigated alluvial soils of drainage bottoms surrounded by mixed-grass prairie between elevations of 5,800 feet (1,758 meters) and 6,200 feet (1,879 meters) (Spackman et al., 1997). Surveys for Colorado butterfly plant within the project area have not been conducted, however, the lack of suitable habitat within the project area makes their presence unlikely.

3.8.5 Migratory Birds

Jefferson County, Colorado encompasses a diverse array of habitats in which 246 bird species have been identified (NDIS, 2000). In and around Golden, Colorado, at least 235 species of birds have been identified and about 90 of those species have been observed on or near North Table Mountain (Foster, 2001). Thirty-five bird species have been identified as present or likely to occur on the STM project area (see Table 3-9). Of these 35 species, 33 are protected under the MBTA, which protects bird species native to North America (USDI, 2001). The migratory status of these birds in Colorado includes 20 residents, 5altitudinal migrants, 7 short distance migrants and 3 neotropical migrants. Additional species, especially during migration, may be present in the STM area.

Spring migration generally occurs between March and May and fall migration generally occurs between August and October. Migratory bird use on or adjacent to the STM area may include breeding, nesting, foraging, perching and roosting activities. Species most likely to nest in the grasslands include killdeer, common nighthawk, horned lark, and western meadowlark. Species that typically nest in shrubland include green-tailed towhee, Brewer's blackbird and mourning dove. Other species may nest in trees on or near the STM area including red-tailed hawk, American robin, blue jay, black-capped chickadee and black-billed magpie.

The STM area provides foraging habitat for all of these species and may be used for perching or roosting by these and other bird species during migration. Raptors may perch on trees while hunting for small mammals and birds located in the grassland and shrubland areas. Other smaller birds, such as the western meadowlark, consume insects that occur in the grassland area.

Breeding generally occurs between May and July. Courtship may begin as early as March for species such as the horned lark. Young birds generally fledge from the nest in August but some species may fledge as late as September (Kingery, 1998).

Table 3-9. Migratory Bird Species Observed and/or Likely to be Present within National Renewable Energy Laboratory South Table Mountain Site, Golden, Colorado[1]

Common Name	Scientific Name	Migratory Status in Colorado[2]	Nest Site			
			Grass/ ground	Shrub	Tree	Other[3]
American crow	*Corvus brachyrhynchos*	Resident		X	X	
American goldfinch	*Carduelis tristis*	Resident		X	X	
American kestrel	*Falco sparverius*	Resident			X	
American robin	*Turdus migratorius*	Altitudinal migrant			X	
Black-billed magpie	*Pica pica*	Resident			X	
Black-capped chickadee	*Parus atricapillus*	Resident			X	
Blue jay	*Cyanocitta cristata*	Resident			X	
Brewer's blackbird	*Euphagus cyanocephalus*	Altitudinal migrant		X		
Brown-headed cowbird	*Molothrus ater*	Short distance migrant			X	
Chipping sparrow	*Spizella passerina*	Short distance migrant		X	X	
Common nighthawk	*Chordeiles minor*	Neotropical migrant	X			
Common raven	*Corvus corax*	Resident				X
Cooper's hawk	*Accipiter cooperii*	Resident			X	
Dark-eyed junco	*Junco hyemalis*	Resident	X			
European starling[4]	*Sturnus vulgaris*	Resident			X	X
Great-horned owl	*Bubo virginianus*	Resident			X	
Green-tailed towhee	*Pipilo chlorurus*	Short distance migrant		X		
Horned lark	*Eremophila alpestris*	Resident	X			
Killdeer	*Charadruis vociferous*	Altitudinal migrant	X			

Common Name	Scientific Name	Migratory Status in Colorado[2]	Nest Site			
			Grass/ ground	Shrub	Tree	Other[3]
Lark bunting	*Calamospiza melanocorys*	Short distance migrant	X			
Lark sparrow	*Chondestes grammacus*	Short distance migrant	X	X		
MacGillivray's warbler	*Oporornis tolmiei*	Neotropical migrant	X	X		
Mountain bluebird	*Sialia currucoides*	Altitudinal migrant			X	
Mourning dove	*Zenaida macroura*	Altitudinal migrant		X		
Northern flicker	*Colaptes auratus*	Resident			X	
Northern harrier	*Circus cyaneus*	Resident	X			
Prairie falcon	*Falco mexicanus*	Resident				X
Red-tailed hawk	*Buteo jamaicensis*	Resident			X	
Red-winged blackbird	*Euphagus cyanocephalus*	Resident	X	X		
Rock dove[4]	*Columba livia*	Resident				X
Say's phoebe	*Sayornis saya*	Short distance migrant				X
Vesper sparrow	*Pooecetes gramineus*	Short distance migrant	X	X		
Western bluebird	*Sialia mexicana*	Resident foothills			X	
Western kingbird	*Tyrannus verticalis*	Neotropical migrant			X	
Western meadowlark	*Sturnella neglecta*	Resident	X			

1 Sources: DOE and NREL (Dames & Moore) 1999, NREL (ERO) 1998; NDIS, 2000; Kingery 1998; Forum, 1987
2 Sources: Andrews and Righter 1992, DeGraaf and Rappole 1995
3 Other category includes cliffs, manmade structures, etc.
4 Not protected under the Migratory Bird Treaty Act

3.9 CULTURAL RESOURCES

Cultural resources are defined as any prehistoric or historic district, site, or building, structure, or object considered important to a culture, subculture, or community for scientific, traditional, religious or any other reason. Cultural resources can be divided into three major categories:

1. Prehistoric and historic archaeological resources.
2. Architectural resources.
3. Traditional cultural resources.

Prehistoric and historic archaeological resources are locations where human activity measurably altered the earth or left deposits of physical remains (e.g., arrowheads, bottles). Prehistoric resources that predate the advent of written records in a region range from a scatter composed of a few artifacts to village sites and rock art. Historic resources may include campsites, roads, fences, trails, dumps, battlegrounds, mines, and a variety of other features.

Architectural resources include standing buildings, dams, canals, bridges, and other structures of historic or aesthetic significance. Architectural resources generally must be more than 50 years old to be considered for protection under existing cultural resource laws. However, more recent structures, such as Cold War facilities, may warrant protection if they manifest the potential to gain significance in the future.

A traditional cultural resource can be defined as a property that is eligible for inclusion in the National Register because of its association with cultural practices or beliefs of a living community that are rooted in the community's history and are important in maintaining the continuing cultural identify of the community. Traditional resources can include archaeological resources, buildings, neighborhoods, prominent topographic features, habitats, plants, animals, and minerals that Native Americans or other groups consider essential for the persistence of their traditional culture.

Cultural resources are protected under Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended. Only significant cultural resources warrant consideration with regard to adverse impacts resulting from a proposed action. Significant cultural resources are either eligible for, or listed on, the National Register. To be eligible for the National Register, a resource must meet one or more of the criteria (as defined in 36 CFR 60.4) for inclusion on the National Register. National Register-eligible resources are those that have one or more of the following characteristics:

a) Are associated with events or have made a significant contribution to the broad patterns of our history;
b) Are associated with lives of persons significant in our past;
c) Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; and/or
d) Have yielded, or may be likely to yield, information important in prehistory or history.

In accordance with federal laws and regulations, efforts to identify significant cultural resources on NREL property included a records search at the Colorado Historical Society Office of Archaeology and Historic Preservation (OAHP) in Denver and review of previous survey reports. Consultation with the State Historical Preservation Officer (SHPO) is presented in Appendix C. The records search confirmed that all NREL land, including the newly acquired 25 acres south of the Denver West Parkway, has been surveyed for Cultural Resources. DWOP Buildings 15, 16, 17, and 27, located off site, were not surveyed as they include only office space within existing office buildings.

The following four cultural resources surveys have been conducted that involve lands within the STM site.

1. Historic Resources Survey Camp George West, Golden, CO (Front Range Research Associates, Inc., 1992).
2. Archaeological Survey of Camp George West and the Works Progress Administration South Table Mountain Basalt Quarries, Jefferson County, CO (Butler, 1992).
3. Historical Review Solar Energy Research Institute Golden, CO (Forum Associates, Inc., 1988).
4. Historic and Prehistoric Resources, South Table Mountain, Golden, CO (Nelson, 1980).

These surveys resulted in the nomination and subsequent listing of one historic district in 1993 (see Figure 3-10). The Camp George West Historic District is located south of the Denver West Parkway and includes the 25-acre parcel recently transferred to NREL.

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INSERT FIGURE 3-10 HISTORIC DISTRICT BOUNDARIES MAP HERE

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3.9.1 Archaeological Resources

There are no known significant archaeological resources within or adjacent to the NREL STM property.

3.9.2 Architectural Resources

There are four significant or contributing historic structures on the STM property (Table 3.9). Two of these resources, the amphitheater and associated footbridge (5JF842) and the ammunition Igloo (5JF843), are individually listed on the National Register. The remaining resources are within the Camp George West Historic District and contribute to the District's eligibility (see Figure 3.10).

Table 3-10. Architectural Resources Identified on the NREL's STM Site

Site #	Description	NRHP Status	Historic District
5JF842	Amphitheater and Footbridge	Listed	N/A
5JF843	Ammunition Igloo (1940)	Listed	N/A
5JF145.66	Firing Range Lines (1924)	Contributing	Camp George West
5JF145.68	Low Rock Walls	Contributing	Camp George West

NRHP- National Register of Historic Places
Listed: Site is listed on the National Register of Historic Places
Contributing: Feature contributes to the overall eligibility of the historic district

The historic amphitheater is an ovate stone structure built into the natural slope of the hillside with a stone projection booth located at the base of the structure. A concrete center aisle separates the theater's concrete and stone seating areas. Some of the associated rock walls and seats have collapsed, and much of the area is overgrown with native vegetation. A small stone footbridge leads to the amphitheater. The bridge is in good condition. Outside groups have expressed an interest in restoring both of these historic structures, but no formal proposal has been submitted.

3.9.3 Traditional Cultural Resources

There are no known significant traditional cultural resources within or adjacent to the STM site.

3.10 HAZARDOUS MATERIALS AND WASTE MANAGEMENT

Hazardous materials are substances that pose a potential hazard to human health and/or the environment if improperly managed. Hazardous wastes are hazardous materials that are no longer needed or usable and are defined as hazardous by the Resource Conservation and Recovery Act (RCRA). At the STM and DWOP sites, management programs for hazardous materials and wastes attempt to reduce impacts to human health and the environment by using the least hazardous materials and most environmentally friendly products to the greatest extent possible, thereby minimizing the use of chemicals that contain hazardous materials, and consequently minimizing the amount of hazardous waste generated.

NREL's hazardous materials management practices are based on NREL Policy 6-2 Environmental Management and 6-6 Risk Assessment, and supported by other policies and programs. Policy 6-6 requires all workers to evaluate new or substantially modified activities by identifying and mitigating/eliminating environmental hazards and their potential impacts. It does so by promoting the identification and control of environmental hazards presented by NREL activities. Policy 6-2 requires evaluations for:

- Emissions to air;
- Releases to surface water, including storm drains;
- Wastewater releases;
- Improper waste management;
- Contamination/releases to land;
- Impacts on communities;
- Use of raw materials and natural resources;
- Impacts to wildlife or vegetation;
- Erosion or contamination of stormwater;
- Contamination of groundwater; and
- Life cycle impacts.

As an example of the implementation of these policies, STM and DWOP staff members notify the NREL ES&H office prior to application of pesticides on their sites so that the pesticide can be evaluated to determine if it is the least harmful choice with respect to human health and the environment.

NREL's waste management procedures are based on NREL Policy 6-2.8 Waste Management and Minimization. It includes guidelines for solid and hazardous waste classification, waste handling, and disposal procedures. Detailed descriptions of waste minimization techniques are also included.

All chemicals and wastes at the STM site are managed through a network of integrated programs centrally managed by NREL. The programs are specifically developed to minimize or eliminate adverse effects on the environment. The programs include chemical acquisition, hazardous chemical training, use monitoring, and disposal tracking. They also address topics such as worker safety and health, chemical safety, compressed gas safety, radiation safety, and asbestos management.

The STM and DWOP sites incorporate pollution prevention practices in their research and support activities to reduce or eliminate the use of hazardous materials. All programs are managed in accordance with applicable federal, state, and local laws, regulations, and DOE/NREL requirements.

Hazardous materials, including lubricating oils, are centrally tracked through NREL's chemical inventory system. The inventory system tracks hazardous materials according to type, quantity, destination, and user. This system is supplemented by a separate waste management system that documents disposition of wastes. Hazardous waste management includes characterization, storage, transportation, and disposal of waste generated at the STM and DWOP sites. Together the two systems provide complete tracking of NREL hazardous materials and hazardous wastes. In addition, NREL actively promotes solid waste recycling.

NREL has an aggressive training program that emphasizes waste minimization and pollution prevention to ensure that chemicals are effectively selected, properly used, and disposed of in compliance with applicable laws and regulations. Chemical management training is mandatory, as are periodic refresher courses. NREL training focuses on chemical use planning, proper selection of the least hazardous materials, safe operating procedures, use of the smallest quantity possible, waste separation, waste reduction, and reuse. Spill contingency plans and reporting procedures are standardized through NREL. Reporting procedures include the preparation of occurrence reports to document incidents involving chemicals.

3.10.1 Hazardous Materials

NREL maintains a comprehensive list of chemicals present at the STM and DWOP sites. Small quantities of a wide variety of chemicals are present. These chemicals are primarily within the following groups: flammable solids and liquids, combustibles, compressed gases, acids, bases, organic materials, oxidizers, cryogenic materials, metals, and common products such as adhesives, caulks, lubricants, thinners, paints, and cleaning compounds. Compressed gas cylinders containing toxic, very toxic and corrosive gases are present in the SERF (see section 3.3.3). Both locations are free of polychlorinated biphenyl (PCB)-bearing materials, whether in transformers or light ballasts.

Asbestos is present in several buildings at the STM site. NREL tracks its asbestos-containing materials (ACM) with periodic inventories. The ACM is described, quantified, and assessed according to its condition. The condition of the ACM remaining on-site is described as "good." The most recent inventory was performed in May 2002.

Small quantities of low-level radioactive materials, including radioactive carbon, hydrogen, and phosphorus, are used as tracer materials in association with some research projects and are periodically inventoried. NREL keeps an inventory of radioactive materials. Radioactive liquids and solids are generated in association with research activities. During the period 1994 through May 2002, 1,349 pounds (gross weight including packaging) of low-level radioactive waste were generated and shipped to an approved off-site facility. No radioactive materials are known to exist in soils at the STM or DWOP sites.

Refrigerants are used and tracked at the STM and DWOP sites. They are used primarily for servicing coolers, water chillers, and building cooling, but some are used for testing purposes. Seven types of refrigerants (R-11 R-12, R-22, R-113, R-134a, R-500, R-502) have been used on-site. The site has stored R-11, R-12, and R-22 on location since early 2000 for future use in existing equipment. The total quantity of refrigerants stored on-site is approximately 320 pounds.

NREL's tank management program includes safeguards that prevent accidental releases and include use of structural controls and operational and inspection procedures. Aboveground storage tanks (ASTs) at the STM site are operated in accordance with CDPHE and the State Inspector of Oils (Colorado Department of Labor and Employment) regulations. Coordination between the State and NREL is required if a tank is installed, removed, repaired or modified, or if its use is changed. The ES&H Office evaluates changes with respect to state regulations and the NREL AST Management Plan.

Five ASTs are located at the STM site and one is located at the DWOP site. These ASTs are for emergency generator and research use. One additional tank is temporarily closed. See Table 3.10 for tank capacity details.

Table 3-11. Aboveground Storage Tanks at the STM Site.

Tank ID	Size (gallons)	Contents	Use
No. 2	800	Diesel	SERF Emergency Generator
No. 3	6,000	Ethanol 50%	PDU Ethanol Storage
No. 4	564	Diesel	PDU Emergency Generator
No. 5	560	Diesel	FTLB Emergency Generator
No. 9	500	Diesel	Building 16 Emergency Generator
No. 15 (temporarily closed)	100	Diesel	AFUF Emergency Generator

In addition to the tanks listed in Table 3.10, the STM site maintains three other tanks that store non-petroleum products. A 3,000-gallon tank and 6,000-gallon tank store liquid nitrogen for use at the SERF and the FTLB, respectively. The third tank stores hydrogen at the SERF. There is also a compressed gas storage tank at the CNG refueling station located behind the OTF. The storage capacity in 40 CNG bottles is 900 cubic feet.

Spills are tracked in a spill-tracking log. Spills exceeding a reporting threshold are reported in the Occurrence Reporting and Processing System, which is part of DOE's emergency notification system. These procedures are integrated into NREL's Emergency Management Program. There have been no spills documented at the STM site for the years 1999, 2001, and 2002, as of May 2002 (NREL, 2002). Spills in quantities greater than incidental amounts are handled according to the NREL Spill Prevention Control and Countermeasures (SPCC) Plan for the STM site.

3.10.2. Hazardous and Non-Hazardous Wastes

The STM and DWOP sites generate a variety of hazardous and non-hazardous wastes from laboratory and mission support activities. All waste handling and disposal activities at both sites comply with the requirements and regulations of OSHA, RCRA, DOE/NREL, and CDPHE. All hazardous wastes are packages and disposed of through contracted off-site commercial treatment, disposal, and recycling firms.

Many of the hazardous wastes generated on the sites are recycled in accordance with CDPHE regulations, including such items as batteries, fluorescent bulbs, and computer monitors. As a BMP in order to ensure maximal protection of the environment, many of the non-hazardous waste materials (non-regulated waste) generated at the sites are treated in the same manner as the hazardous wastes. These materials, although not classified as hazardous, are also recycled or disposed of at offsite commercial treatment, storage, disposal, and recycling facilities.

The STM site and the DWOP have distinct Colorado generator numbers and different generator classifications. The STM site is a Small Quantity Generator (SQG), which means that the facility generates more than 220.5 pounds but less than 2,205 pounds of hazardous waste per month. DWOP is a Conditionally Exempt Small Quantity Generator (CESQG), which means that the facility generates less than 220.5 pounds of hazardous waste per month. Hazardous waste tracking mechanisms and procedures are in place such that internal reviews track waste generation activities at the STM site in order to maintain SQG status. The STM site does not maintain a treatment, storage, and disposal facility.

The amount of hazardous and non-regulated waste generated by the STM site in recent years is shown in Table 3-11.

Table 3-12. Waste Generation at the STM Site

Year	1998	1999	2000	2001	2002
Amount of hazardous waste (gross weight: pounds)	11,476	34,764	7,140	24,894	2,840*
Amount of non-regulated waste (gross weight: pounds)	15,380	6,765	1,410	1,930	670*

* Quantities shown for the year 2002 reflect amounts generated as of May 2002.

The amount of hazardous and non-regulated waste generated by the DWOP in recent years is shown in Table 3-12.

Table 3-13. Waste Generation at DWOP Site

Year	1998	1999	2000	2001	2002
Amount of hazardous waste (gross weight: pounds)	394	793	370	240	65*
Amount of non-regulated waste (gross weight:pounds)	240	0	10	0	0*

* Quantities shown for the year 2002 reflect amounts generated as of May 2002.

NREL's Site Operations Office manages solid waste. NREL's activities produce about 235,910 cubic feet of solid waste annually. Solid waste is deposited in a local landfill through contracts with solid waste handling companies.

There are no known contaminated materials in STM soils or groundwater (see Sections 3.6 Water Resources and 3.7 Soils and Geology for related information).

3.10.3 Recycled Materials

NREL's formal waste minimization program includes an active recycling program. NREL collects and recycles oils (lubricants and antifreeze), fluorescent light bulbs, batteries, freon from refrigeration units, and scrap metals (iron, copper, steel, stainless steel, tin, and aluminum). Other recycled materials include wooden pallets, cardboard, newspaper, office paper, books, glass and plastic containers, packaging peanuts, tyvek, transparencies, and toner cartridges. NREL encourages employees to bring in recyclable materials from home and use the collection containers in selected NREL parking lots.

Table 3-13 lists amounts of some recycled materials at the STM site in recent years. Table 3-13 does not include quantities for all recycled materials at the STM site.

Table 3-14. Recycled Materials at the STM Site

Year	1998	1999	2000	2001	2002
Batteries (gross weight: pounds)	345	1,350	380	1,015	2,250*
Fluorescent Bulbs (gross weight: pounds)	825	1,350	675	160	385*
Used Oil (gallons)	700	400	460	450	700*

* Quantities shown for the year 2002 reflect amounts generated as of May 2002.

Table 3-14 lists amounts of some recycled materials at the DWOP in recent years. The DWOP does not generate used oil. The table does not include quantities for all recycled materials at the DWOP.

Table 3-15. Recycled Materials at DWOP Site

Year	1998	1999	2000	2001	2002
Batteries (pounds)	40	200	80	0	155*
Fluorescent Bulbs (pounds)	0	40	0	0	0*

* Quantities shown for the year 2002 reflect amounts generated as of May 2002.

3.11 PUBLIC SERVICES AND UTILITIES

The following discussions address electricity and gas, telecommunications, water, sewage service, emergency response and fire protection. Storm water drainage is addressed in Sections 3.6 and 4.6, Water Resources. Energy is discussed in Sections 3.12 and 4.12. Figure 3-11 presents the locations of existing on-site utility lines. The emphasis of this discussion is on the STM site since improvements there could result in the need for new facilities, increased capacities, and/or other impacts on service providers.

3.11.1 Electricity and Gas

Electrical power for the STM site is delivered through an Xcel Energy overhead, 13.2-kilovolt (kV) electrical distribution line that enters the site via an easement from the west end of Denver West Parkway. The STM site features a 13.2-kV high voltage distribution system that features three loops to provide electricity to the buildings on site. This distribution system and the transformers associated with each of the on-site buildings are owned, maintained, and operated by NREL. It is anticipated that this electrical system is adequate to serve the STM site for the foreseeable future. In line with its mission, NREL committed to purchase "green power," in the form of wind power, from Xcel Energy in 1999.

Xcel Energy also provides natural gas to the STM site via a main pipeline located along the main site access road (see Figure 3-11). In addition, a 20-inch regional distribution line (1,000 pounds per square inch (psi)) passes through the site. This pipeline runs north-to-south through the site between the FTLB and OTF and up to the mesa top. The gas line that serves the site is adequate to meet natural gas needs at the STM site for the foreseeable future.

3.11.2 Telecommunications

Qwest provides telephone and electronic communications services at the STM site. Although the existing telecommunications service at the site is considered adequate for current needs, NREL would increase the capacity of the system to meet increased needs in the future. The existing analog communications technology is being replaced with digital communications technology, and the Data System Infrastructure Project has installed fiber optic data and communications networks throughout the STM and DWOP sites to provide increased bandwidth. It is anticipated that in the future, the capacity of these systems will need to be increased to allow access to high-performance computing capabilities at other laboratories. Two five-inch conduits are routed through Denver West Parkway to the west of the STM site for future use.

3.11.3 Water

The Consolidated Mutual Water Company (CMWC) provides domestic water to the STM site. The CMWC serves 85,000 people in Jefferson County within a 23 square-mile service area. The existing water system is considered adequate to meet current and future needs, but drought conditions in March of 2003 have substantially limited available water supplies. The recently constructed 9,000-acre-foot Walter S. Welton Reservoir (formerly named the Fortune Reservoir) located elsewhere within the CMWC District area had not been filled due to drought conditions. As a result of the recent drought, CMWC enacted several restrictions and policies on water use. Based on information provided on the CMWC web site, these restrictions and policies include:

- All new taps, including "stub ins," are restricted to water use inside the house or building until the drought is over and water restrictions have been lifted (it is anticipated that these restriction will be in place until at least June 2003). Limited outside water use is permitted for construction purposes only;
- Tap applications that have already been received and all fees paid (stock, water development fee, tap fee, and meter materials) will be honored;

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INSERT FIGURE 3.11 INSERT UTILITIES MAP HERE

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- CMWC will honor all unexpired taps that have been "stubbed in." Stub-ins that were applied for more than 2 years ago are expired and will be subject to the same guidelines as if applying for a new tap;
- Taps will be available to developers, contractors, etc. that already have a main line extension in progress (i.e., fees paid and agreements signed);
- All other new taps will be limited and reviewed on an individual basis. A building permit and verification of a first-pour of the foundation will be required for consideration. It should not be assumed that a tap will be automatically granted if this criterion is met; and
- All outside lawn irrigation is suspended until further notice. Hand watering of trees and shrubs through a single garden hose with an attached shot-off nozzle is allowed between 4:00 p.m. and 6:00 p.m. on Wednesdays and 2:00 p.m. and 4:00 p.m. on Saturdays.

More recently, drought conditions have changed. Based on consultation with Neal Santangelo, Project Engineer with Consolidated Mutual on April 30, 2003, the water supply issue for the S&TF and other future development is as follows:

- Consolidated Mutual has a tap moratorium in place that applies to new users only.
- NREL's STM Complex is an existing user not subject to the tap moratorium.
- Water supplies, taps and service are available for the STM Complex.

In wet and normal years, the CMWC system is considered adequate to meet existing and future water demands (Queen, 2002).

3.11.4 Sewer Service

The Pleasant View Water and Sanitation District provides sewer service to the lower portions of the STM site. A septic tank and leach field system serves the one toilet, one hand sink and one janitor's sink located within the existing mesa top facilities.

Wastewater from the sewer system is discharged to Denver's Metro Wastewater Reclamation District. This system is considered adequate for existing and anticipated future sewage needs. The downstream collection system operated by the Pleasant View Water and Sanitation District is in the process of being upgraded from a 15 inch to a 24-inch pipe that should be in operation by the end of December (Isom, 2002).

3.11.5 Emergency Response and Fire Protection

In the event of a crime or other issues requiring law enforcement assistance at the STM site, on-site security personnel would respond. If off-site support were required, the Jefferson County Sheriff would be contacted. In the event of a crime or other issues requiring law enforcement assistance at the DWOP site, the City of Lakewood Police Department would be contacted.

Fire fighting equipment for buildings and facilities located below the mesa slopes includes a water supply (fire hydrant, dry hydrant, or another type of water supply) for every building except the Bulk Storage Facility and the PDU Emergency Generator buildings. Facilities on the mesa top do not have a water supply for fire protection. All facilities at the STM site have external horns and strobes that are activated when the fire alarm is triggered. Fire detection systems at the STM site are monitored by the West Metro Fire Protection District (West Metro), which

receives the signal directly from the NREL system. With the exception of the Bulk Storage and PDU Emergency Generator buildings (which do not have any form of fire protection), all buildings on the lower STM site have multiple fire protection systems. The Visitor Center, Site Entrance Building, FTLB, OTF, TTF, S&R, and Facilities Shed all feature fire detection (fire or smoke detector heads), fire alarm, and fire sprinkler systems. In addition to these systems, the SERF also features a standpipe and fire pump, while the AFUF has multiple fire sprinkler systems, a foam deluge system, and a fire pump. The SERF and AFUF have fire detection systems in the elevator lobbies and the heating, ventilation, and air conditioning systems.

To protect the site from wildfire, NREL applies its Fire Protection Program to the site, which includes wildfire protection requirements. The NREL Fire Protection Program is available on the NREL website under ES&H Programs. In 2001, Fire Mark Limited conducted an Updated Fire and Life Safety Analysis of NREL's FTLB, a Wildfire Hazard Assessment of the STM site, and an Assessment of the NREL Fire Protection Program. This assessment concluded that Fire Protection Program at the STM site is excellent. The Fire Mark Limited Wildfire Hazard Assessment concluded that the wildfire hazard potential for both the lower STM site and the mesa is low (Fire Mark Limited, 2001).

In the event of a fire on the STM or DWOP sites, West Metro is under contract to provide emergency service equipment and personnel. West Metro would also provide ambulance service. In the event of an on-site injury, illness, or other situation requiring an ambulance, West Metro personnel and equipment would be dispatched to the site. Emergency services for adjacent properties are provided by several jurisdictions including West Metro and Pleasant View. West Metro staff and equipment capabilities are being expanded to address the new demand created by the Colorado Mills Mall and other new development within their service boundaries (Abbink, 2002).

3.12 ENERGY EFFICIENCY AND RENEWABLE ENERGY

Energy is the subject of evolving national policy and longstanding debates over sources, infrastructure requirements, pricing mechanisms, environmental impacts, and related regulations and public processes. Peak period demand shortages in California in the summer of 2001 generated renewed interest in energy policy, and fueled old and new energy debates.

It is not the purpose of this EA to fully characterize energy policy or substantive points in the energy debates. This EA sets forth the idea that the mission of NREL is to lead research, development, and technology transfer in the areas of energy efficiency and renewable energy. The STM site is a nationally significant facility dedicated to this mission.

In this role, NREL takes energy conservation seriously and has implemented a comprehensive energy program as part of the "Sustainable NREL" initiative (see Section 2.7). NREL has a standing goal to reduce conventional energy use and views itself as a "model for the nation" in terms of sustainable technologies and designs. The Sustainable NREL initiative addresses the following energy-related topics.

- Energy efficient building design guidelines and operational parameters including a goal of creating "zero energy" buildings that maximize use of energy conservation technology and use solar, thermal, and PV systems to meet the remaining loads.
- Analysis of process loads to reduce consumption.

- Using renewable energy from on-site and off-site sources, where appropriate.
- Operating highly energy efficient vehicle fleets including the use of light duty alternative fuel vehicles.
- Encouraging employee ridesharing, minimizing commuting through alternative work schedule options, and reducing business travel, where possible.

Energy Standards for DOE facilities are set forth in DOE Order 430.2 (Draft). This order requires following 10 CFR 435, which sets efficiency standards for building components (insulation, windows, etc.) and EO 13123, Greening the Government Through Efficient Energy Management.

Xcel Energy provides energy in the form of electricity and gas to the project area. Related infrastructure issues are discussed in Section 3.11 and 4.11 Public Services and Utilities.

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INSERT SITE PHOTOS HERE – FIGURE 3-5.

4. ENVIRONMENTAL CONSEQUENCES AND MITIGATION MEASURES

Chapter 4 addresses primary, direct, induced, secondary and cumulative impacts of the Proposed Action and No Action Alternatives. Beneficial and adverse, on-site and off-site, construction, operation, and maintenance impacts are also described, as appropriate.

The following analyses focus on overall site development impacts resulting from a range of improvements and changes anticipated at NREL's STM and DWOP sites. The emphasis of these discussions is on the STM site because changes at the DWOP site do not involve construction but rather the additional use of existing, privately owned, and leased buildings, thereby limiting the potential for many kinds of environmental impacts. Specific impacts from individual improvements are provided, where appropriate, to clarify a unique environmental situation or consequence of a specific program element. The impact analyses presented in this chapter consider NREL's broad and extensive environmental commitments as described in Chapter 1, and refer to specific commitments, as appropriate, to characterize potential impacts and substantiate related impact findings.

4.1 LAND USE, PLANNING, PUBLIC POLICY, SOCIOECONOMICS

4.1.1 Land Use Impacts

NREL would lease approximately 35,500 square feet of additional office space at the DWOP site. Proposed uses associated with this additional space would be consistent with NREL's current use of the DWOP site, and limited construction activity would be expected for NREL's expansion within the existing business park. Consequently, the emphasis of the following discussion is on land use changes at the STM site.

The proposed improvements at the STM site would involve approximately 126,000 sf of office and laboratory space. The development associated with this increase would have minor on-site and off-site land use impacts as a result of converting undeveloped land to urban uses (laboratory space, roads and parking); these minor on-site and off-site impacts are discussed in more detail below. Future improvements at the STM site are anticipated in Zones 1, 3, 4, 5, and 6 (see Table 2.3). No improvements are proposed in Zone 2 (Conservation Area) or Zone 7 (Historic Resources).

Each improvement at the STM site would be subject to review by the NREL Design Advisory Board (DAB). The DAB process would address consistency of a proposed project with the results of the ongoing site planning effort leading toward the 25-Year General Development Plan and the applicable programs, policies, and procedures implemented by NREL at the STM site that are in place to avoid and/or minimize impacts from existing and future activities at the site. The ongoing site planning effort and the DAB process are expected to minimize any land use impacts from future improvements at the STM site.

New buildings and facilities would allow for increased research and development activities that would be generally consistent with existing uses. For example, the proposed S&TF would provide for PV research and expand activities currently conducted in the SERF. Proposed building designs would be consistent with existing on-site development and would be designed to avoid land use conflicts, compatibility issues, or other land use impacts such as nuisances (noise, odor, etc.). To minimize conflicts, NREL has established a building height limit of five stories and proposes setbacks from the edge of buildings to adjacent property lines. The only

improvement that is fully specified is the S&TF building in Zone 4 (see Chapter 2). In summary, the primary improvements would include:

- Several new buildings and research areas as well as associated access roads and parking areas.
- Several expansions of and/or modifications to existing buildings and facilities.
- A number of infrastructure and improvement projects.

These improvements, including the S&TF building, would add a total of approximately 126,000 [S1]sf of interior space at the STM site by 2008 (see Table 2.2) and increase the site's development density over time. However, this development density would not be out of scale with neighboring commercial development to the east.

As shown in Table 2.3, construction of new facilities and expansions and modifications to existing facilities would predominantly occur in Zone 3 West Campus, Zone 4 Central Campus, Zone 5 East Campus, and Zone 6 Camp George West Parcel. Each of these zones is located at or below the toe of South Table Mountain, away from sensitive mesa top and slope areas. Zones 3 and 4 are already highly developed. Facility construction, modification, and expansion within these zones would primarily involve infill development. Zones 5 and 6 are largely undeveloped.

As stated in Chapter 2 Proposed Action and Alternatives, plans illustrating various future land development concepts for the STM site have been developed, but these plans are not current and are not included as site planning assumptions. In 2002, NREL began a new site planning effort to develop a 25-Year General Development Plan for the NREL's sites (both STM and NWTC). The outcome of this effort will be a single unified vision for the STM site with flexibility enough to allow for adaptation so it continues to align with laboratory and program priorities as they change over time.

Based on the past plans and the flexibility that is anticipated from the 25-Year General Development Plan, key land use issues primarily relate to development in close proximity to: adjacent residential areas located south of Zone 3; residential areas east and west of Zone 6; the planned park located south of Zone 6; and the Camden Denver West condominiums located east of Zone 5.

Although development of Zones 3, 5, and 6 would increase the scale and intensity of office and research and development uses adjacent to residential areas, this would not result in land use impacts because proposed facilities would be consistent with existing facilities and the mix of residential and office-related land uses in the area. Additionally, with regard to Zone 5, preservation of the existing trail easement along the eastern boundary of the site would provide a substantial setback between STM site development and the Camden Denver West condominiums. It is not anticipated that development within Zone 6 would adversely affect recreational use at the planned park to the south, particularly considering that use of the park would likely be most intense during the evening and on weekends when the STM site would be least active.

Development within Zone 1 (Top of Mesa Buildable Area) is anticipated to include modifications of existing facilities, including expansion of the SRRL. The building expansion is expected to add 1,344 sf of space contiguous to the existing building. For perspective, if the perimeter of this addition were square, it would measure less than 40 feet on each side. Other changes in

Zone 1 could include the placement of different and/or additional outdoor renewable energy devices within the area designated for development. The SRRC expansion would be permanent, but the solar devices and associated equipment would be temporary or transient to some degree. The time frames for deployment of the devices and equipment would be defined by specific experiments and testing configurations.

Development of mesa top areas is discouraged by local government policy and has been the subject of community controversy. However, public policy and community controversy were the basis for the land transfer that resulted in the formation of the 176.78-acre Zone 2 Conservation Area and the decision to prevent development in Zone 7. For these reasons and because the only new development proposed on the 13-acres of Zone 1 is the SRRC expansion, the land use impact at buildout would be considered insignificant. Visual impacts from Zone 1 improvements are described in Section 4.5.

Growth inducement created by an enhanced facility and pressure for private sector ventures to locate in the immediate vicinity are not expected to be significant because the STM site would continue to provide on-site facilities for related private sector ventures, and because the growing office space capacity within the vicinity of the site could accommodate anticipated demand.

4.1.2 Compatibility with Applicable Local Plans, Policies, and Anticipated Future Development

Although the local government plans and policies are not applicable to federal lands such as the STM site, the following discussions compare the proposed development with local government zoning designations and characterize land use and planning issues that future on-site and off-site development may present.

The planned improvements would be considered office or research and development uses, which is inconsistent with the A-2 zoning designation placed on the site by Jefferson County. However, since the proposed uses are consistent with historical and anticipated uses of the site and given that local government policies do not apply to the site, this difference would not be considered a significant impact. In addition, it is anticipated that building setbacks, particularly within Zones 3, 5, and 6, would be generally consistent with local zoning standards and would provide adequate transitions between residential uses and new buildings. These setbacks will vary and will be determined during the site planning process and/or during the final design processes for individual buildings.

The conservation easement, as well as utility and trail easements throughout the site, will be preserved. Access via the trail easement corridor through the unsecured portions of the site between the mesa top and off-site residential and park areas will remain open to the public.

4.1.3 Social and Economic Impacts

Executive Order 12898, enacted by President Clinton in 1993, requires that each federal agency make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations.

The concentration of low-income persons in Census Tract 101 requires "environmental justice" issues to be considered and related findings to be made. In summary, these issues and

findings clarify whether disproportionate impacts on this population would occur as a result of the Proposed Action. The key issues include whether direct, significant, unmitigated and unavoidable adverse impacts would occur to this population and whether these or other impacts on this population would be considered disproportionate relative to impacts on other moderate-income or high-income populations. The findings are as follows:

- The Proposed Action does not create significant, unmitigated and unavoidable adverse impacts.
- The impacts of the Proposed Action on off-site residential areas are distributed evenly and equitably along the site's southern and eastern boundaries from infill development in Zones 3, 4, 5 and 6.
- No disproportionate impacts on the concentration of low-income households would occur since similar impacts would be expected in the neighborhoods south of Zone 3 and east of Zone 5.

The Proposed Action would have no direct impacts on minority populations because no off-site human health or environmental effects of the Proposed Action are anticipated, and because no concentrations of minority populations are located in the vicinity of the site.

The Proposed Action would have positive direct and indirect economic impacts because it would create jobs and involve substantial construction expenditures. A total of 359 new workers would be located at the STM and DWOP sites by 2008. These new jobs, as well as construction jobs and construction expenditures, would incrementally increase local housing demands and corresponding economic activity in the vicinity. These indirect impacts would not be considered significant given considerably larger economic forces and activities in the region, and would generally be considered beneficial by local governments pursuing economic development.

4.1.4 Impacts of the No Action Alternative

The No Action Alternative would allow existing on-site land uses, site development density and operations to remain unchanged. Fewer beneficial economic impacts would result because building construction would not occur and related job growth would be limited.

MITIGATION MEASURES

There are no significant impacts; therefore no mitigation measures are required.

4.2 TRAFFIC AND CIRCULATION

As described in Section 3.2, the following discussion is based on consultation with local governments and the information and findings presented in a Traffic Impact Study prepared by Felsburg Holt & Ullevig for the STM site in November of 2002 (NREL (FHU), 2002). However, it is important to note that the Traffic Impact Study analyzed possible short-term and long-term conditions different from those defined by the Proposed Action for this EA. In summary, the impact assessment in the Traffic Impact Study concluded that a total of 700 new workers could be located at STM while still maintaining acceptable levels of service at local intersections. However, this EA evaluates a total of 269 new workers at STM and 90 workers at DWOP in 2008. Larger numbers of new workers on either site by or beyond 2008 as too speculative at this time.

4.2.1 Trip Generation

Vehicle trip rates documented in the latest edition of the Institute of Transportation Engineer's (ITE) *Trip Generation* manual were used to estimate traffic generated by the Proposed Action. Since the NREL is a research facility, trip data associated with the ITE land use category for "Research and Development" was used to estimate project-generated traffic. The trip generation rate for this category is 2.77 trips per worker per day. This rate includes worker commute trips, other daily trips by workers and trips anticipated by others associated with the operation of the research and development use. Given this rate and the anticipated net increase of 269 new workers at the STM site by 2008, this portion of the Proposed Action would be expected to generate a total of 745 trips daily.

The 90 new workers in the DWOP would not be expected to generate a net increase in trips because the additional workers would be expected to occupy existing buildings at DWOP rather than new buildings. No new trips would be generated because the space to be used is already occupied and generating trips (see Section 4.2.2 for an assumption associated with re-directed trips between DWOP and STM).

Table 4-1 summarizes the daily and peak hour trips that would be generated by the Proposed Action.

Table 4-1. Trip Generation from the Proposed Action

Land Use Description	Daily Trips	AM Peak Hour Trips			PM Peak Hour Trips		
		In	Out	Total	In	Out	Total
Research & Development (269 New STM Employees)	745	99	16	115	11	99	110

4.2.2 Trip Distribution and Assignment

The vehicle trips shown in Table 4-1 were assigned to each of the intersections along Denver West Marriott Boulevard using directional distribution estimates. The distribution estimates were based on existing travel patterns along the study corridor. Travel patterns were determined from the existing turning traffic counts described in Section 3.2. The estimated distribution percentages are as follows:

Direction	Distribution
EAST - via Denver West Parkway	15%
EAST - via Interstate 70	30%
WEST - via Interstate 70	30%
SOUTH -via Denver West Marriott Blvd.	25%

Due to the likelihood that new DWOP workers would travel to the STM site due to business obligations more often than the workers they would displace, the trip generation figures representing movements between the two sites that are based on STM traffic alone may be slightly low.

Assuming 90 new workers at DWOP would generate approximately 249 new trips per day and 15 percent of those new trips would occur at peak hour, a total of approximately 37 peak hour trips would be expected. Clearly, some proportion of those 37 peak hour trips would be direct trips between DWOP and STM that did not occur before, but went elsewhere. It has been assumed that 15 percent of the 37 peak hour trips would be trips between STM and DWOP that did not occur before and the remainder would be trips typical of the previous office workers. Given these assumptions, six peak hour trips should be added to the STM trip generation distribution figures. Of these six trips, one-third of these peak-hour trips are assumed to change morning commute destinations and the balance of 4 would be direct trips between STM and DWOP. It can be assumed that these trips would be split evenly in terms of directions (inbound and outbound) and the A.M. and P.M. peak periods. These trips would be added to the network, but they would be relatively inconsequential and are not shown in Figure 4-1.

4.2.3 On-Site Circulation and Access Impacts

The trips generated by the Proposed Action and the planned construction would not change overall circulation or access with respect to the STM or DWOP sites. Existing ingress and egress routes to STM would be unchanged and would continue to be controlled by security gates. Minor changes to circulation patterns would be created by construction of the S&TF as shown in Figures 2-2 and 2-3. Ingress and egress routes throughout the DWOP site would remain open to the public and unchanged.

The additional trips from the Proposed Action would increase on-site parking requirements and vehicle use within and surrounding the STM site. Future development and related approval processes implemented at the STM site would address internal circulation and parking requirements as each project goes through final design. Primary on-site roads are expected to accommodate increased vehicle volumes without improvements.

The existing on-site parking that was constructed as part of the existing SERF would be utilized for required parking for the S&TF. The lack of new parking associated with the S&TF is not expected to create a parking shortage because sufficient parking is available and many of the S&TF workers are expected to be workers moving from overcrowded conditions in the SERF rather than new workers.

The S&TF would provide a vehicular turnaround at the northeast corner of the existing parking access drive and a new pedestrian sidewalk would provide access to the S&TF. These facilities are designed to accommodate anticipated on-site circulation and access requirements.

4.2.4 Future Traffic Volumes and Level of Service Impacts

To determine future traffic impacts of the Proposed Action, existing and future traffic volumes were considered. The following discussion characterizes future traffic volumes and then characterizes the impacts of project related trips.

INSERT FIGURE 4-1 2008 PROJECT GENERATED TRAFFIC VOLUMES HERE

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Trips on local roadways and through local intersections have increased recently due to the December 2002 opening of the Colorado Mills Mall. These volumes are expected to increase further in the future as a result of infill development and redevelopment in the vicinity. The Proposed Action would incrementally add to these local traffic volumes and would contribute incrementally to accidents in the vicinity. However, the contribution of the project to these impacts would be considered less than significant and no new accident hazards or risks would be added.

Two sources were primarily utilized to determine future traffic conditions in the study area. These sources included 1) the *Colorado Mills Development Traffic Impact Analysis*, Wells & Associates, March 2000, and 2) the *Denver West Housing Traffic Impact Analysis*, Felsburg Holt & Ullevig, March 1999 (NREL (FHU), 2002).

The Colorado Mills Mall development is a major retail center being constructed along the south side of West Colfax Avenue, between Denver West Marriott Boulevard and Indiana Street. The Colorado Mills Mall traffic study was an update to the *Denver West Shopping District Traffic Impact Analysis* (NREL (FHU), 2002).

The Denver West Housing development is a proposed residential project located along Denver West Circle (north of Denver West Parkway), and consists of both multi-family apartments and patio homes. The traffic study conducted for this development also accounted for the buildout of the office area along Denver West Circle, which was evaluated in the *Denver West Development Traffic Impact Analysis* (NREL FHU), 2002).

Neither the Colorado Mills Mall nor the Denver West Housing traffic impact studies assumed that the existing NREL site would be expanded in the future. Consequently, the total traffic volume forecasts obtained from these studies did not include any traffic growth associated with NREL's STM or DWOP sites. Therefore, the total traffic forecasts from these studies were used as "background" traffic (i.e., non-project related traffic volumes).

Future peak-hour traffic volumes for 2022 from the Traffic Impact Report assuming 700 new STM workers are presented in Figure 4-2. Figure 4-3 presents corresponding 2022 Levels of Service presented in the Traffic Impact Report considering 700 additional STM site workers. Under these 2022 conditions, LOSs are acceptable (LOS "C" or better). Consequently, traffic associated with the Proposed Action in 2008 would remain acceptable (LOS "C" or better) in all instances.

4.2.5 Accident Impacts

The Proposed Action would incrementally increase traffic volumes, but would not substantially increase accident rates due to congestion and would not create new traffic network conditions that would be expected to create hazards or increase accident potentials.

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INSERT FIGURE 4-2 2022 PEAK HOUR TRAFFIC VOLUMES ASSUMING 700 NEW STM WORKERS HERE

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INSERT FIGURE 4-3 2022 LEVELS OF SERVICE ASSUMING 700 STM WORKERS HERE

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4.2.6 Impacts of the No Action Alternative

The No Action Alternative would allow existing development and employee totals at the STM and DWOP sites to remain unchanged. Incremental impacts from site development associated with the Proposed Action on LOSs would be avoided. The existing circulation system and parking availability at the STM and DWOP sites are considered sufficient to meet current personnel levels without the proposed improvements that would occur under the Proposed Action.

MITIGATION MEASURES

There are no significant impacts; therefore, no mitigation is necessary.

4.3 AIR QUALITY

Air quality impacts are indicated by changes in the concentrations of atmospheric pollutants as a result of specified actions and their corresponding relationship to state and federal standards. This section discusses impacts to air quality from site preparation and construction at the STM site resulting from the Proposed Action and impacts resulting from emissions associated with subsequent site operations. The purpose of the air quality analysis is to provide a qualitative assessment of construction and operational impacts to air quality resulting from the Proposed Action rather than to define precise emission levels and corresponding mitigation measures. Consequently, modeling was not performed to precisely calculate future emissions.

NREL has an ongoing overall Air Quality Protection program, an Indoor Air Quality program, a Particulate Emissions Control for Construction program, a Local Exhaust Ventilation program, and a wide range of other programs that directly and indirectly contribute to avoiding, minimizing and mitigating air pollution emissions and associated impacts and risks. These programs are in place and would apply to all future improvements and activities at the STM and DWOP sites.

Emissions resulting from construction activities under the Proposed Action would be intermittent, and would not be expected to exceed ambient air quality standards or substantially impact regional air quality attainment status or progress. Based on proposed activities and operations, operational emissions resulting from new facilities and increased use of existing STM and DWOP facilities are expected to be insignificant.

4.3.1 Construction Impacts

During construction of the S&TF and other buildings and facilities, temporary and localized increases in atmospheric concentrations of NO_X, CO, SO_2, VOCs, and PM would result from exhaust emissions from worker's vehicles, heavy construction vehicles, and other machinery, equipment and tools. The construction perimeter of the S&TF would be approximately 700 feet (230 meters) from the nearest offsite residence. Other construction area perimeters would be closer, but those boundaries have not yet been defined.

Vehicle emissions are addressed by Colorado regulations for licensing and are not subject to other regulatory requirements. Air quality impacts would also result from airborne particulates (fugitive dust) arising from earthwork during site preparation and construction. New construction at the STM site would be conducted in phases; therefore, emissions of fugitive dust would not

be continuous. Under certain wind conditions, there could be incremental localized increases in particulate emissions at nearby downwind receptors. Because the wind direction is primarily from the southwest at the STM site, particulates would tend to drift to the northeast. Residences to the east of the site would be the most likely to be impacted by particulate emissions.

NREL's Particulate Emissions Control Plan would minimize impacts from the construction of improvements at the STM site. The plan is approved by the State and implements conditions contained in Permit Number 00JE0009L, the site-wide permit for the emission of particulates associated with land development. All construction operations would comply with the terms and conditions of that permit. Therefore, discontinuous particulate emissions associated with construction operations would remain within regulatory constraints and would not significantly impact nearby residences.

4.3.2 Impacts from New Equipment and Operations

Emissions resulting from new sources would contribute an amount of pollutants that would not significantly increase those emissions that are currently generated, significantly impact ambient air pollution concentrations, or adversely impact site workers or nearby residents. There would be no new major stationary sources or major modifications to existing operations associated with the Proposed Action.

New emissions sources could include alternative fueling stations, traditional and alternative fuel storage tanks, new or modified boilers, backup power units and laboratory hood vents, and various storage tanks. Emissions from the S&TF in Zone 4 would be from modifications to the SERF boiler, the boiler for hot water and the diesel fueled engine generator for emergency power.

The greatest aggregate amount of potential emissions currently generated at the site is 46.41 TPY of NOx. This quantity of NOx emissions is significantly lower than the 100-TPY potential-to-emit (PTE) threshold for Major Source designation. The future boilers, the generator, and any other equipment associated with new construction are unlikely to potentially approach the major source threshold for a criteria pollutant.

As described in Section 2.1.2, specialty gases will be piped through the S&TF and a dedicated gas storage room (Toxic Gas Room) would have cabinets to house gas cylinders. The cylinders would contain various gases including toxic, highly toxic and corrosive gases. The gases would be controlled and monitored within the building. The use of toxic, highly toxic and corrosive gases in the S&TF could increase the generation of HAPs emitted from the STM site depending on how these gases are used or through accidental release. However, the presence and use of these gases are not expected to contribute to HAPs emissions. Implementation of NREL's programs and the required controls and monitoring would adequate address adverse air quality impacts to NREL personnel and offsite receptors. Installation of toxic gas monitors in the S&TF would ensure personnel safety within and outside of the S&TF (see Section 4.10 Hazardous Materials and Wastes).

Consistent with Colorado regulations, NREL ES&H staff would evaluate emissions associated with all new emissions sources prior to their installation. Although impacts to air quality are not expected to be significant, NREL would comply with notifications and permitting strategies implemented by the State to minimize the impacts of its emissions.

Because the nature of site operations would not materially change with the implementation of the Proposed Action, no noticeable odors would be expected at offsite locations.

4.3.3 Impacts of the No Action Alternative

If the Proposed Action were not implemented, incremental air quality impacts of the Proposed Action would not occur. Existing emissions from on-site operations would remain at current levels.

MITIGATION MEASURES

There are no significant impacts; therefore no mitigation is necessary.

4.4 NOISE

Impacts resulting from increased noise levels are indicated by changes in the ambient noise levels as a result of specified actions. This section discusses impacts to the sensitive receptors from site preparation and construction at the STM and DWOP sites resulting from the Proposed Action and subsequent site operations. The purpose of this analysis is to provide a qualitative assessment of construction and operational impacts to ambient noise levels resulting from the Proposed Action rather than to define precise noise levels and corresponding mitigation measures. Consequently, modeling was not performed to estimate future noise levels. Estimates of noise levels presented in this section are based on the data presented in Section 3.2.

Construction noise under the Proposed Action would be intermittent during normal working hours over a period of five years from 2003 to 2008. Construction would cause temporary increases to the ambient noise level near the STM site. Noise levels associated with construction are most likely be the greatest during the next two years when the proposed S&TF building (STM's largest proposed structure) would be built. Noise levels associated with construction would continue intermittently thereafter, but would decrease in duration. Based on proposed activities, operational noise resulting from new facilities and increased use of existing NREL facilities are expected to be insignificant. The STM site maintains compliance with all regulations related to worker health and safety. Exposure to work-related sources of noise is regulated by OSHA under 29 CFR 1910.95. The requirements contained within this regulation would protect NREL staff from work-related hearing loss.

4.4.1 Impacts from Construction Noise

The Proposed Action would result in construction noise from heavy equipment operation, building of foundations and structures, earthwork, and trenching and utility installation. Expansion of the facilities at the STM site would not occur continually. Construction would be phased, resulting in intermittent generation of noise during daylight hours over a five-year period. Construction of the S&TF is expected to start first and take approximately 21 months. Exterior construction would be completed in approximately 10 to 11 months. Other improvements would be expected in Zones 1, 3, 4, 5 and 6 between 2003 and 2008.

Noise levels associated with increased vehicle traffic resulting from construction activities would be temporary and limited to the times when construction actually takes place. Construction vehicles would be able to access the STM site directly and avoid travel through nearby residential neighborhoods. Temporary increases in noise associated with construction traffic would produce a minor and inconsequential impact at nearby receptors near the southern boundaries of Zones 3, 4, 5 and 6 and the east end of Zone 5.

Construction operations could generate temporary noise levels up to 95 dBA measured at a reference level of 50 feet (15.5 meters) from the source (Salter, 2000). NREL could construct buildings, parking lots or other facilities at or within close proximity to their boundaries, but in key locations, such as east of Zone 6 and west of the Camden Denver West condominiums, there are trail corridors to prevent construction up to the site boundaries. The trail corridor west of the condominiums is 250 feet (33 meters) wide. The trail corridor at the eastern end of Zone 6 is approximately 30 feet (10 meters) wide. In addition, previous site planning efforts and anticipated plans provide setbacks between new construction and parcel boundaries.

Table 4.2 displays the reduction in noise intensity associated with a 95-dB construction-related source over increasing distances. Table 4.2 does not consider additional factors that contribute to the reduction of noise intensity, such as topography, weather conditions, and noise sources external to the STM site.

Table 4-2. Reduction of Sound Level Intensity of a 95-dBA (Construction-Related) Source and 75-dBA Source (Bus Idling) as a Function of Receptor Distance.

Distance in feet (meters)	Construction-Related dBA	Bus Idling dBA
50 (15.5)	95	75
100 (30.3)	89	69
200 (60.6)	83	63
250 (75.7)	81.5	61.5
300 (90.9)	80	60 (nearest receptor)
400 (121.2)	77	--
500 (151.5)	75.5	--
800 (242.4)	71	--

Although condominiums east of the STM site (Zones 2 and 5) are located approximately 50 feet (15.5 meters) from the site property line, a 250-foot (75.5-meter) trail corridor running north-south just inside of the eastern STM property line provides an additional buffer between construction on the STM site and the condominium residences. If development were to occur at the edge of the trail corridor, construction activities would be located approximately 300 feet (90.9 meters) away from the nearest residences to the east. It is possible, therefore, that construction activities could generate maximum noise levels estimated to be 80 dBA to those residents.

If development were to occur in Zone 5 (the southeastern portion of the STM site), it would probably take place north of the access road to the STM site. The access road roughly parallels the southeast site boundary from approximately 50 feet (15.5 meters) to 200 feet (60.6 meters)

from the site boundary. It is expected that construction would be located at least 300 feet (90.9 meters) from the nearest residences to the south. It is possible, therefore, that construction activities could generate maximum noise levels estimated to be 80 dBA to those residents. If bus service were increased to the STM site because of expanded operations, the service would continue to be limited to workday hours primarily during the day. Noise from a bus idling at the Visitor Center is estimated to be 60 dBA at the closest residences.

Construction of the S&TF in Zone 4 would be further from residential receptors than the previously discussed examples, so corresponding noise levels would be lower.

If development were to occur in Zone 6 (on the southernmost 25-acre STM parcel), the development would have the potential to cause increased noise level at the adjacent park. Noise levels at the future ball fields could be described as those of an "urban environment," and are estimated to range between 75 and 80 dBA when the fields are in use. Maximum construction noise levels at 300 feet (90.9 meters) are estimated to be approximately 80 dBA.

Although there are residences close (approximately 50 feet (15.5 meters)) to the southwestern STM property line, site property is already developed in this area near the STM site property line (Zone 3, or West Campus). Future construction in that area of the STM site would consist of infill development between existing buildings, and may be as close as 200 feet (60.6 meters) to the property line. Maximum construction noise levels at 250 feet (75.7 meters) are estimated to be approximately 81.5 dBA.

Although the steep slopes of South Table Mountain are dedicated as a conservation easement (Zone 2) and are not available for development, limited development may occur on the top of South Table Mountain in Zone 1. The nearest residences to Zone 1 are located to the south of the STM site near the southwestern property line. It is estimated that the residences are at least 800 feet (242.4 meters) away with an elevation difference of approximately 300 feet (90.9 meters), resulting in an approximate 850-foot (257-meter) displacement. It is estimated that construction activities could generate a maximum noise level of 71 dBA at these nearby receptors depending on the location of the activity in Zone 1. Noise levels generated beyond a direct line of sight between source and receptor would be reduced relative to those in direct view. Noise resulting from construction operations in Zone 1 is not expected to significantly impact the State Highway Patrol's training operations on their track, but it could temporarily disturb wildlife and recreation uses such as hiking on mesa top trails. However, neither impact would be considered significant due to the limited amount of construction that is expected, the temporary nature of that construction, and the availability of large areas of the mesa top for wildlife and hiking.

Although the ambient noise in the vicinity of the STM site results from traffic on nearby I-70, it is unlikely that highway noise would mask the noise associated with construction activities at the STM site, as perceived by the nearest residents. The STM site is approximately 1,400 feet (423 meters) from I-70 at its southeastern corner.

Although regulatory authorities from the City of Denver and the State of Colorado do not apply to the STM site, they can provide a reasonable (but not enforceable) basis with which to assess potential noise impacts. The Denver noise ordinance allows a sound pressure level of 80 dBA measured at the boundary of an industrial site (not necessarily undergoing construction activities). The state regulations limit noise from construction projects to 80 dBA measured 25 feet (8 meters) from the property line. The estimates of noise generated by construction

activities at various locations of the STM site suggest that the State and Denver noise limits may be slightly exceeded at the residences near the STM site if the maximum noise estimates that have been anticipated actually occur. Distances were estimated from maps and other mitigating factors (such as topography, wind direction, presence of intervening structures or vegetation) were not considered. Therefore, it is likely that construction noise generated at the STM site would actually be less than these estimates.

4.4.2 Impacts from Operational Noise

The impact of additional operational noise generation at the STM and DWOP sites is expected to be incidental and insignificant both within on-site buildings and at off-site receptors. Compliance with OSHA requirements for noise exposure is a site mandate; therefore, anticipated impacts on NREL staff would be minimized and mitigated. The use of machines, equipment and tools at the STM and DWOP sites would temporarily and incrementally increase typical operational noise. Most equipment and tool noise would be confined to the interiors of the site buildings. There may be incidental exterior noise generated by maintenance operations, onsite vehicle travel, and the addition of up to two small-scale wind turbines in Zone 3.

Noise associated with maintenance would be of short duration and is not expected to impact off-site receptors for extended periods. Anticipated noise levels from these sources would not be expected to be higher than those generated from construction activity sources and would likely be lower in some instances.

Up to two small-scale wind turbines may be installed in Zone 3. These turbines would generate noise during periods where the turbines would be used for research or demonstration purposes. Operation may be constant or intermittent and would depend on wind conditions. Noise levels from typical, modern, small-scale turbines such as the model that is currently approved, the Whisper H40, would not be expected to increase offsite noise levels at sensitive receptors substantially, nor would they create substantial onsite noise impacts for workers or visitors. Noise levels from operation of the wind turbine model that is expected in this location were analyzed in June of 2001 by NREL for the manufacturer in a study entitled: “Wind Turbine Generator System Acoustic Noise Test Report for the Whisper H40 Wind Turbine.” This work was performed under DOE’s small turbine field verification program. In summary, operation of two similar turbines operating at the same time would generate noise levels that are not much higher than ambient noise levels at off-site sensitive receptors in nearby neighborhoods. The relative difference with and without the turbines is expected to be inconsequential.

Incremental noise impacts at off-site receptors from additional vehicle trips to and from the STM site would increase vehicle noise (see Section 3.2). The increase in vehicle noise at the STM site would generally be highest during the A.M and P.M commute peak hours and would not be expected to be substantial due to low vehicle speeds and because the vast majority of traffic to and from the STM site during peak hour would not travel through or into the interior of nearby residential areas.

Noise generation from new workers at the DWOP site would not occur because new NREL workers and related trips are expected to replace other workers currently working in the DWOP who already generate similar trips.

The relationship between noise and wildlife is discussed in Section 4.8.

4.4.3 Impacts of the No Action Alternative

No "new" noise sources would be added to the STM site if the No Action Alternative were implemented. Off-site noise levels in the area would continue to be dominated by vehicle traffic on I-70.

MITIGATION MEASURES

There are no significant impacts; therefore no mitigation is necessary.

4.5 VISUAL QUALITY/AESTHETICS

4.5.1 Visual Impacts of Proposed Buildings, Test Facilities, and Other Site Features

The Proposed Action would modify existing facilities and add new features to the STM site that would increase development scale and density at the site, thereby increasing site visibility from numerous off-site vantage points. Although future changes might be noticeable from off-site vantage points, they would not be considered significant adverse visual impacts for the following reasons: 1) the new facilities and features would be reasonably consistent with existing development in the vicinity, 2) views of the mesa top and slopes would not be substantially altered from public vantage points, 3) views from primary public vantage points would not be blocked or substantially degraded, 4) development of the site and related infill of the property has been anticipated, and 5) final designs for new development would be subject to review by NREL's DAB and their recommendations would be followed to address visual and aesthetic impacts.

The following discussion describes potential visual impacts associated with the proposed S&TF facility, followed by a zone-by-zone description of potential impacts. Figure 4.4 presents photographs that characterize the potential visibility of existing and proposed buildings, solar facilities, and other site facilities and features from off-site vantage points. These photographs are presented at the end of Chapter 4.

Science and Technology Facility (S&TF)

The proposed plans and designs for the S&TF provide for a three-story, stand-alone building housing the photovoltaic research sector. Exterior building design features and materials would be similar to and compatible with those of the adjacent SERF. The new building will be located such that there will be a gap remaining between it and the SERF of approximately 78 feet (26 meters), the width of the existing utility easement located east of the SERF. The S&TF would have a comparable structural module, use the same exterior cladding and glazing materials, and be built immediately east-northeast of the SERF below the slope of South Table Mountain.

The S&TF building would be visible from local streets and homes in the Pleasant View neighborhood that are located at the STM site boundary and from distant vantage points at higher elevations to the south and west. The new building would change views of the site by converting grassland to developed land and by blocking certain views of a portion of the mesa slope from some vantage points. No new parking would be added, and therefore, this form of

lighting would not be included in this improvement. When completed, the new building would blend into the existing SERF building and appear to be an extension of the existing facility.

Mesa Top Development (Zone 1)

The SRRL, one of the existing mesa top buildings, would be expanded by 1,344 sf (half of the current square footage). Building heights are not expected to change in the future. These structures are visible from certain off-site locations. Rough exterior dimensions for the proposed expansion would be approximately 40 feet (12 meters) by 40 feet (12 meters). This expansion represents far less than one percent of the proposed STM development square footage.

The visual impact of this improvement and permanent or temporary deployment of solar research equipment that might occur would involve a minor net increase in visibility of mesa top development from off-site receptors. This visibility is generally defined in Figure 4.4, photo 2. Use of the westerly portion of Zone 1 for buildings or equipment would have the most noticeable impact because it would broaden the apparent development width of mesa top development from certain vantage points. Development in areas close to the existing facilities, especially to the north, would have lesser impacts of this type.

Interior and exterior lighting would be expected to increase, but the use of motion sensors and other mechanisms to reduce or eliminate visibility of lighting from off-site locations are proposed and would be expected to reduce lighting impacts to insignificant levels.

Zones 3 through 6

New facilities and additions to current structures would be dispersed throughout the lower portions of the STM site within Zones 3 through 6. The potential distribution of new development is presented in Table 2.3.

In addition to new facilities and structures, construction of new service roads and supplementary parking areas with night lighting would be required to support the increase in activity on the STM site. The ground level features would have a minimal visual impact on the visual characteristics of the STM site as the surrounding topography would block views of these features from most off-site vantage points.

New buildings, facilities (including up to two small-scale wind turbines and related ancillary facilities), and night lighting from parking areas and other sources in Zone 3 would be visible from homes located along West 14th Place and other vantage points. The wind turbine tower height would be 40 feet (13 meters) or shorter, depending on the selected turbine model. The tower and blades would be visible from off-site locations, but would not create a significant adverse impact because the likely site for the turbines would be within the photovoltaic test area where other research equipment is located. The turbines would not be expected to dominate views and over time would be screened by intervening future buildings relative to some offsite viewpoints.

The density of development in Zone 3 is expected to increase as undeveloped spaces are filled in over time. Views of the mesa slope from West 14th Place would be replaced by views of the new buildings and related facilities. These changes to views from private properties would not be considered significant visual impacts because this new development has been anticipated and would be consistent with the visual characteristics of nearby development. Most residents

in the Pleasant View neighborhood would not have direct views of these new improvements from their homes. These changes would be most visible to neighbors near NREL's east and south site boundaries.

Views of improvements in Zone 4 are likely to be the most visible from off-site vantage points and from vantage points near the southeast corner of the STM site. The S&TF would be located in this area along with the possibility of further development of facilities and building additions. These future developments would be highly visible as this area is located in the center of the STM site and can be viewed from two major highways and from vantage points in surrounding neighborhoods. These changes would be most visible to neighbors near NREL's east and south site boundaries. However, the infill development would be designed to reflect the current architecture and designs already present on the STM site and would not block views of the mesa slope from public vantage points. Views from the future Camp George West Park are discussed later with respect to Zone 6 development.

The Visitor Center, located at the main entrance to the facility (Zone 5), would be expanded to the north and/or west and new parking and night lighting would be added. The addition could double the present size of the Visitor Center. This expansion and other improvements in Zones 4 and 5 would substantively change views from residential vantage points in the immediate vicinity and along the western end of Denver West Parkway. In general, buildings of up to five stories could replace views of vacant land and some views of the mesa slopes from roads and private vantage points could be blocked depending on the final design of the proposed facilities. These changes to views from private properties would not be considered significant visual impacts because this new development would be consistent with the visual characteristics of nearby development. These changes would be most visible to neighbors near NREL's east and south site boundaries.

Future changes in Zone 5 could involve development up to the trail corridor boundary located approximately 250 feet (33 meters) west of the Camden Denver West condominiums. Construction of buildings (up to five stories) in this location and the intensification of development across Zones 3, 4, and 5 would substantially change views from these new residential vantage points depending on the final design of the proposed facilities. These changes to views from private properties would not be considered significant visual impacts because this new development would be consistent with the visual characteristics of nearby development. These changes would be most visible to neighbors near NREL's east and south site boundaries.

Views from Nile Street and Kendrick Street of Zone 6 would also change as a result of new STM development and future construction of lighted ball fields and other improvements associated with Camp George West Park. Buildings would replace undeveloped areas on the NREL property north of the park. South of the STM site, ball fields, including light standards for nighttime play on one centrally located field that are not part of the Proposed Action, would be added to the view.

Depending on the level of development and the final design of the future facilities that are constructed in Zone 6, views of the mesa slopes from adjacent residences and the future Camp George West Park could be blocked or disrupted. Some local residents may find the visual impacts of the new facilities are objectionable. However, these impacts would not be considered significant for previously mentioned reasons, and because the Camp George West

land was acquired in association with a mesa top land protection effort connected to local visual quality preservation policies.

4.5.2 Impacts of the No Action Alternative

The No Action alternative would leave overall site features and associated visual elements unchanged. Visual impacts of the Proposed Action would be avoided.

MITIGATION MEASURES

There are no significant impacts anticipated from the Proposed Action; therefore no mitigation is necessary.

4.6 WATER RESOURCES

Water resource impacts are typically indicated by degradation of the quality of surface water and/or groundwater or substantial changes to stormwater quantities and/or runoff rates. This section discusses potential impacts to surface water and groundwater from the proposed construction of new facilities at the STM site and the ongoing operation of existing and proposed STM facilities. In addition, this section addresses project impacts in relation to EO 11988, *Floodplain Management*. EO11988 directs all federal agencies to avoid, if possible, development and other activities in the 100-year base floodplain. Federal agencies are required to:

- Reduce the risk of flood loss;
- Minimize the impact of floods on human safety, health and welfare; and
- Restore and preserve the natural and beneficial values served by floodplains in carrying out agency responsibility.

EO 11988 requires agencies to avoid disrupting these areas whenever there is a practicable alternative, and to minimize any harm that might be caused by federal actions.

Sampling of surface water and groundwater and/or modeling were not performed in association with the preparation of this section.

4.6.1 Surface Water and Stormwater Impacts

Construction of the S&TF, doubling the area of the Visitor Center parking lot, and other infill project would increase impervious surface area, which could include increase quantities of stormwater conveyed off-site, increase runoff rates, and incrementally degrade surface water quality. Increased turbidity and quantities of various chemicals associated with automobiles, herbicide and pesticide use on the site would be expected. However, these impacts would be addressed by the following:

- NREL's state-issued NPDES permit to construct;
- Implementation of NREL's existing programs, policies, and practices aimed at minimizing impacts on water resources; and
- Implementation of planned improvements that are expected to include various options to enhance the efficient use of water.

Changes in the quantity of stormwater and runoff rates could incrementally impact localized flooding in Lena Gulch; however, implementation of SWPPP measures would minimize off-site drainage impacts as a result of development at the STM site. During the design process for the S&TF in Zone 4 and other projects, drainage structures will be designed on-site to prevent an increase in the flow rate of stormwater conveyed off-site. For example, the S&TF design would direct stormwater to the existing detention pond and landscaped areas. Other future projects may include modifications to existing stormwater management structures (intakes, channels and detention basins). Stream bank erosion, channel scouring, sedimentation of stream channels, displacement of aquatic organisms, and incremental degradation of water quality during and immediately after storms would thereby be prevented.

As new development occurs and vacant lands on the site are converted to urban uses, the use of automobiles would be expected to increase proportionately. Traces of petroleum products originating from leaking vehicles could be transported from the pavement off-site via stormwater. These contaminants could contribute to water quality degradation, but potential impacts would be considered insignificant relative to stormwater volumes and actual contaminant concentrations that could be transported off-site.

In the case of a spill or release of chemicals or hydrocarbons during construction or facility operation, existing BMPs and procedures associated with spill response and materials handling would minimize impacts to surface water. These procedures are defined in the NREL SPCC Plan for the STM site.

4.6.2 Groundwater Impacts

Impacts to groundwater from construction and operational activities at the STM site are expected to be minor. However, groundwater may be encountered during excavations for the S&TF in Zone 4, other portions of Zone 4 and in Zones 3 and 5. If groundwater occurs, it would be pumped from the excavation to a vegetated area rather than into drainage. The vegetated areas would act as filters to trap sediment and reduce impact associated with groundwater disposal.

As site development occurs, groundwater recharge would be incrementally decreased by the creation of additional impervious surface on the site. This loss would represent a small percentage of the total STM acreage and would not have meaningful consequences on recharge or groundwater availability in the vicinity. Groundwater would not be withdrawn in association with future site activities except to monitor groundwater quality, as necessary. Consequently, no significant impacts are expected to the unconfined aquifer of the Denver Formation.

In the case of a spill or release of chemicals or hydrocarbons during construction or facility operation, existing BMPs and procedures associated with spill response and materials handling would minimize subsurface impacts. These procedures are defined in the NREL SPCC Plan for the STM site.

4.6.3 Impacts of the No Action Alternative

The No Action Alternative would have no impacts to surface water, stormwater, or groundwater resources. Implementation of the No Action Alternative would preclude potential impacts resulting from improvements associated with the Proposed Action.

MITIGATION MEASURES

There are no significant impacts; therefore, no mitigation is necessary.

4.7 GEOLOGY AND SOILS

Impacts to geologic features and soils are indicated by the losses of their current usefulness and productivity. This section discusses the assessment of potential environmental impacts to geologic resources and soils during site preparation, construction, and operation of the expanded facility. Impacts to the geological and soil resources at the site resulting from the Proposed Action are expected to be insignificant.

4.7.1 Impacts to Geological Resources

Resources such as concrete aggregate, crushed rock, and asphalt would be required during construction at the expanded facility. These materials would be obtained from off-site commercial sources or may involve use of material from on-site excavations.

Excavation for new structures may occur below the alluvial surface at the STM site at the base of South Table Mountain. Although the alluvium can range up to 35 feet deep, minimizing the need to blast the Denver formation bedrock for construction purposes, major cuts and fills will likely be required for the S&TF and possibly other facilities as well. Excavation could conceivably go below the alluvium if reaching bedrock for stability is necessary.

Construction activities on the top of South Table Mountain would probably disturb the basalt layer that underlies the thin (approximately five inches) Lavina loam soil layer. Facilities proposed for the mesa top are of minimal size, research-oriented, and would probably not require blasting for their construction.

It is unlikely that construction of new facilities would increase landslide potential at the STM site in the future because there is no evidence of recent landslides on the south side of South Table Mountain, no on-site or off-site construction in the immediate vicinity of the STM site has caused slope instability, NREL construction proposals avoid steep slopes, and the steep slopes within the STM site are in the Zone 2 conservation area where no development is proposed or anticipated. Excavations at the base of the slope in Zone 4 for the S&TF and other possible improvements would apply the most current engineering design specifications to avoid slope stability impacts. Retaining walls are proposed on the north side of the construction area and are designed to maintain slope stability.

Although located in a Jefferson County “Designated Dipping Bedrock Area,” the STM site is situated above the Denver formation to the east near its steeply dipping western limb. Assuming that the dip of the Denver formation reflects the gradient of groundwater flow below the STM site, the Denver formation dips to the south/southeast at approximately three degrees.

Impacts resulting from expansive claystone layers within the Denver formation would be reduced by its relatively small dip and the presence of up to 35 feet (12 meters) of alluvial material above the bedrock; therefore impacts resulting from dipping bedrock are unlikely. There may, however, be impacts to new facilities built on the lower portion of the STM site from rockfall originating from potentially unstable slopes on the south side of the mountain. These rockfall impacts are avoidable with proper site planning and design.

There is no evidence that construction or operational activities, as described by the Proposed Action, would precipitate seismic activity in the vicinity of the site. The STM site is classified as being in Seismic Zone 1, an area of low seismic risk. Structures to be built on the STM site would meet the most current Uniform Building Code Standards appropriate for its designated seismic zone.

The impacts to land use, loss of vegetation and habitat are described in Sections 4.1 and 4.8. Impacts to water drainage and water erosion are described in Section 4.6.

4.7.2 Impacts to Soils

Topsoil would be removed and surface soil would be disturbed by construction activities. Excess soil would be removed from the STM site or redistributed on the site by the contractor. There would be some loss of soils due to the physical alteration of the existing soil profile. However, the nonproductive attributes of most of the site's soils preclude agricultural utility; therefore, the loss of these non-productive soils would be insignificant. NREL would import fill and/or topsoil, if necessary.

Most of the construction on the lower, southeastern portion of the STM site (Zones 4 and 5) would take place on Denver clay loam and Denver cobbley clay loam. These soils consist predominantly of clayey material predisposed to shrinking and swelling. Their inherent instability requires precautions to be taken during construction activities. Proper engineering design will be taken to minimize the effects of shrinking and swelling. Precautions could include backfilling structures with materials that have a low shrink-swell potential and installing surface and subsurface drains near building foundations. Road and building designs would compensate for the soils' low strength. The soil would be compacted before building begins. Maintaining adequate vegetative cover and avoiding construction near drainages would control erosion resulting from the soils' medium runoff potential. These soils exhibit a moderate tendency to be transported by wind. Erosion control proposals for the S&TF, common to NREL construction processes, include:

- "Feather in" grades to make them look more natural;
- Use of seeding and erosion control mats on all disturbed areas;
- Avoid extending grading beyond the designed grading ties; and
- Use sediment control devices at specified discharge points to accumulate sediment and prevent migration downstream.

Refer to Section 4.6 Water Resources for stormwater impact discussions.

The STM site has developed a fugitive dust plan for land development that addresses measures to be taken during construction activities to prevent impacts from transport of particulates.

The proposed site for the S&TF, within Zone 4, is a disturbed site that exhibits past dumping of construction debris and the deposit of excavated soil, which most likely occurred during construction of the SERF. The building would occupy the disturbed site, and it is intended that the site would be returned to natural grades by removal of the construction debris and fill soils, pending funding availability. Proposed grading for the S&TF generally falls within existing grades, except on the east side where doors at the basement and office levels exit the building. This area would require fills up to eight feet (2.4 meters) along the eastern elevation for the grading to tie into the slab elevation.

Construction on the southwestern portion of the STM site (Zone 3) would impact the Leyden-Standley-Primen stoney clay loam and a smaller area of Standley-Leyden Primen very stoney clay loam. These soils are not inherently suitable for use as building foundations; however, the STM site has constructed buildings previously on these soils after taking the proper engineering precautions. These soils are found on areas where the slope of the land is slightly greater, requiring construction designs to compensate for potential soil slippage. As with Denver clay loam and Denver cobbley clay loam, the shrink-swell potential and low strength can be overcome by using the measures described in the previous paragraph as well as other suitable techniques. The possibility of particle transport via the wind is slight (USDA, 1980). Although new buildings would be constructed between existing buildings, construction near several drainages that exist in that zone would be designed to minimize water erosion resulting from storm events. In addition, construction activities would be regulated by the site's NPDES stormwater permit. The conditions of the permit are implemented by NREL's "Stormwater Pollution Prevention Program for Construction Activities," which would minimize impacts to surface waters resulting from stormwater.

The area of steep slope on the south side of South Table Mountain (Zone 2) is set aside as a conservation easement. Therefore, there would be no impacts to the Leyden-Primen-Standley soil complex. The stability of the soils on the steep slopes would not be affected by construction activities.

Disturbance of the Lavina loam on top of South Table Mountain (Zone 1) would be limited to a small area for expansion of the SRRL, as described in the Proposed Action. The moderate-to-high shrink-swell potential and the shallow depth of the Lavina loam limits its natural suitability for construction purposes; however, the proposed facilities for this area would be small, research-oriented structures. Its shrink-swell potential can be overcome with proper engineering techniques similar to those described for the other soils at the STM site. Disturbing the soil as a result of construction activities could slightly increase the soil particles' ability to be transported by the wind. Erosion by water on mesa top construction sites would not be significant because the mesa top is relatively flat.

4.7.3 Impacts of the No Action Alternative

The No Action Alternative would result in no impacts to geological resources. Minor impacts to soil resources from ongoing site activities would be expected.

MITIGATION MEASURES

There are no significant impacts anticipated from the Proposed Action; therefore, no mitigation is necessary.

4.8 BIOLOGICAL RESOURCES

NREL has extensive programs, policies and practices designed to avoid, minimize and mitigate impacts to the biological resources of the site. These efforts range from the designation of a formal conservation easement covering sensitive locations, to detailed efforts to restore disrupted areas and control noxious weed invasion.

Despite these plans, policies, and practices, impacts to the biological resources at the STM site could occur in three ways:

1. Direct impacts, such as direct loss of individuals of a species or individual species;
2. Secondary impacts, such as loss of habitat and degradation of habitat quality; and
3. Cumulative impacts which include the additive impacts resulting from past, present, and planned future activities from the project or other reasonably foreseeable projects.

The direct and secondary impacts caused by construction or other disturbances can be either permanent or temporary.

4.8.1 Vegetation Impacts

If the Proposed Action is fully implemented, site development would occur in Zones 1, 3, 4, 5, and 6, with the majority of potential impacts to vegetation occurring in Zones 3, 4, 5, and 6. Site development will not occur in Zone 2 because it is a conservation easement area. In addition, no development would occur in Zone 7 in order to protect existing natural and cultural resources in this area.

Zone 2 contains the majority of the shrubland habitat at the STM site; therefore, impacts on this habitat type elsewhere are quite limited and would be considered insignificant. The primary impacts from new development would be direct, permanent loss of grassland habitat in Zones 4, 5 and 6. Quantification of these losses is not possible without detailed site plans for future development. However, the open grassland area, defined by the limits of grading would be lost. This direct loss of grassland habitat would not be considered significant because both shortgrass prairie and mixed-grass prairie lack formal and direct protection, and the isolated nature of this on-site grassland located within the boundaries of the STM site limits its habitat values. Additionally, 177 acres of the site have been preserved for conservation of prairie and associated habitats. Incremental losses of grassland would also impact wildlife (see Sections 4.8.3 and 4.8.4).

Land clearing, excavation and construction staging areas, such as those associated with the S&TF, would disturb site vegetation. These disturbed areas would have an increased susceptibility to noxious weed invasion. As stated in Section 3.8, noxious weeds such as Canada thistle, diffuse knapweed, musk thistle, houndstongue, field bindweed, common teasel, jointed goatgrass and dalmatian toadflax occur on the site and are found on either the list of the ten most widespread noxious weeds in the State of Colorado, or on Jefferson County's list of noxious weeds of concern. The potential spread of these species, as well as cheatgrass and the other 12 noxious weed species found at the STM site, into disturbed areas represents secondary impacts as a result of the Proposed Action. NREL has made efforts to combat noxious weed invasion. These efforts include implementation of a noxious weed management plan, which includes the use of a native grassland seed mix to be used in restoration areas after construction. Based on NREL's approach to noxious weeds, the Proposed Action's impacts would not be considered significant.

4.8.2 Wetland Impacts

Three (STM-1, STM-2 and STM-7) of the six wetlands found at the STM site are within the conservation easement area (Zone 2) up gradient from most of the areas to be developed under the Proposed Action (see Figure 3.9 in Section 3.8). Only three wetlands (STM-6, STM-10, STM-11) totaling 525 sf (0.01 acres) could be directly impacted as a result of the Proposed Action. Wetland STM-6 is located behind the SERF building in Zone 4 and may be impacted by infrastructure modifications or improvements, and/or maintenance activities. Wetland STM-10 is located in Zone 6 and may be impacted by site development in this area. Wetland STM-11 is located at the southeastern edge of Zone 5 and may be impacted due to road improvements and/or road maintenance. If wetland STM-11 is determined to be jurisdictional by the USACE, use of an existing nationwide permit may be necessary.

Potential secondary impacts from the Proposed Action to wetland resources may include runoff of sediments from nearby construction activities and the invasion of noxious weeds from construction/disturbed areas into wetland habitat. Due to their relative locations to the developments under the Proposed Action, these types of secondary impacts could only occur at wetlands STM-6, STM-7, and STM-10. If they do occur, such secondary impacts are likely to be insignificant to the wetland resource.

Loss or degradation of these wetlands may be avoided by site planning efforts, but if they are lost, they would incrementally contribute to cumulative losses of wetlands, which are protected habitats. However, the direct loss of 525 sf (0.01 acres) would be considered insignificant.

4.8.3 Wildlife Impacts

The Proposed Action would not significantly impact wildlife in the area because sensitive mesa top and slope areas will be preserved, and the lower portion of the site is isolated and does not provide habitat for protected species.

Impacts from the two wind turbines on birds (injury and/or mortality from flying through the rotors) is not expected to be significant because the rotor sweep area is rather small, the density of turbines is low, and there would be no guy wires.

New development would directly and indirectly impact some individual animals or plants and incrementally contribute to cumulative losses of mixed-grass and shortgrass prairie habitat. These habitat losses would directly impact indigenous small mammal and reptile populations, as well as grassland bird species. Wildlife impacts from grassland habitat losses would not be considered significant because grassland habitat has been protected on-site and off-site in the project vicinity as permanent undeveloped space (Zone 2), the isolated nature of the shortgrass prairie that would be lost, and the lack of documented protected species within this habitat (see Section 4.8.4).

Secondary impacts due to the loss of this grassland habitat would reduce the overall size of local hunting areas of resident mammalian and avian predators such as coyotes, fox, red-tailed hawks, and owls. In addition, loss of habitat in Zones 4 and 6 would reduce habitat connectivity for land-based animals between the conservation easement in Zone 2 and Lena Gulch, located just south of the site at Camp George West. Local populations of mule deer, coyotes, and other species that have relatively large foraging areas may be adversely affected by this loss in

habitat connectivity. Maintenance of undeveloped corridors between Zones 2, 4, and 6 would minimize this impact.

Secondary impacts to wildlife may also occur due to habitat degradation caused by noxious weed invasion and increased noise levels from vehicle travel, construction, maintenance and wind turbine operations (Bowles, 1995). Weed infestation can alter habitats enough to cause some species to lose cover or food sources important to their survival. Noise is another type of secondary impact that may affect wildlife; however, the incremental increases in noise associated with the Proposed Action are not expected to be significant, and resident populations of wildlife species are expected to habituate. Increased noise levels due to construction activities and wind turbine operations may temporarily influence wildlife distribution within the STM site.

4.8.4 Species of Concern Impacts

Potential impacts on species of concern that are likely to occur in the project area, or could possibly occur at STM, are described in the following discussion.

American Peregrine Falcon, Bald Eagle, and Ferruginous Hawk - All three of these avian predators could possibly occur within the project area as transients. The American peregrine falcon feeds primarily on birds. A reduction in the total grassland bird population at STM may have a very minor adverse impact on their overall prey base, but is not considered to be significant to the distribution or overall population of these falcons. No adverse impacts to the bald eagle will occur due to the fact that there are no known roosts or nests at the STM site, and no suitable foraging habitat of the bald eagle will be impacted. The Proposed Action may slightly diminish cottontail rabbit populations in the area, which may have a minor adverse impact to the prey base of the ferruginous hawk. However, this impact is considered to be insignificant due to the abundance of cottontail rabbits in Zones 2 and 7 and the surrounding area. In addition, because there are no prairie dogs at the site, no impacts will occur to this species, which is one of the ferruginous hawk's primary food sources. The Proposed Action is not expected to significantly contribute to the cumulative loss of habitat for these raptor species.

Black-Tailed Prairie Dog - Although appropriate habitat does exist at the STM site for black-tailed prairie dogs, no individuals or colonies were observed on site during the 2002 SAIC site visit. Therefore, no direct or secondary impacts to this species are anticipated under the Proposed Action. The Proposed Action is not expected to significantly contribute to the cumulative loss of habitat of the black-tailed prairie dog.

Preble's Meadow Jumping Mouse (PMJM) – On-site improvements and activities associated with the Proposed Action will not adversely affect PMJM populations or their habitat because no suitable PMJM habitat occurs at the STM site. The potential PMJM habitat located in Zone 3 at Drainage 7 is unlikely to be impacted by the Proposed Action. It is unlikely that PMJM will occur on the site or PMJM habitat will develop on the site because the drainages lack perennial water sources. The Proposed Action is not expected to significantly contribute to the cumulative loss of habitat of the PMJM.

Colorado Butterfly Plant and Ute Ladies'-tresses Orchid – Based on the 2001 survey of the site conducted by Plantae (NREL (Plantae), 2002), no Ute ladies'-tresses orchid or Colorado butterfly plants occur on the STM property. The ephemeral drainages at STM do not contain suitable habitat for the Colorado butterfly plant or the Ute ladies'-tresses orchid; therefore, the

undocumented occurrence of either species is unlikely. In addition, the ephemeral drainages primarily occur within Zone 2, the conservation easement area, which will not be developed. The Proposed Action will not adversely affect Ute ladies'-tresses orchid, Colorado butterfly plant, or their habitat. The Proposed Action is not expected to significantly contribute to the cumulative loss of habitat for these plant species.

4.8.5 Migratory Birds

The proposed activities could have an adverse affect on migratory birds and raptors that utilize the area. Antennas, wind driven turbines, and lighting may all have a negative affect on the birds by causing direct mortality and disrupting breeding, nesting, and foraging behaviors. In addition, nests may be disturbed during the construction phase, and less area will be available for nesting after the proposed development is completed. Measures presented below would mitigate potential impacts to migratory birds.

4.8.6 Impacts of the No Action Alternative

Under the No Action Alternative minimal direct, secondary, or cumulative impacts associated with ongoing operations would occur to the vegetative communities at STM. Ongoing weed management activities are expected to control existing noxious weed populations. Water resources supporting the small, isolated wetlands at the STM site are likely to remain constant.

The No Action Alternative would not affect individuals or habitats of the Ute ladies'-tresses orchid, Colorado butterfly plant or the PMJM.

MITIGATION MEASURES

NREL already employs various strategies to limit man-made disturbances to the natural environment. For example the Stormwater Pollution Prevention Program for Construction Activities (SPPPCA) requires reseeding temporarily disturbed areas with a native seed mix developed specifically for the STM site, and the use of Certified Weed Free Mulch. Other BMPs required under the SPPPCA include erosion control measures such as erosion control blankets, mulching, sediment basins, erosion bales, and silt fencing. NREL's SPCC program provides guidance on preventing and responding to spills of fuel and hazardous construction materials. NREL has also adopted a weed management program for the STM site, which has specifically targeted diffuse knapweed, Canada thistle, and dalmatian toadflax. Weed management at the STM site is adaptive and takes an integrated approach to the different methods available for weed control (e.g., education, prevention, reseeding, biological, mechanical, and chemical).

The following mitigation measure should be implemented to address potential impacts of the Proposed Action:

- As site development proceeds, NREL will consider site development alternatives that maintain habitat connectivity between Lena Gulch and Zone 2 (Conservation Easement) via undeveloped natural corridors.
- Construction areas and access roads should be fenced to limit disturbance to grassland habitat outside of the construction zone.
- If necessary, where water and maintenance requirements can be met, native shrub and tree species should be replaced if they are removed during construction activities.

- DOE will conduct a field survey of the site for migratory birds and raptors to update its existing data and establish general Best Management Practices (BMPs) for the STM site.
- When future construction may impact potential habitat for migratory birds, NREL will identify any appropriate field surveys to clarify impacts and develop customized BMPs to be applied during and after construction, if necessary. An example of a customized BMP may involve delaying construction until identified nests are no longer being used for the season.

The implementation of these measures is consistent with NREL's overall practices at the STM site and will be incorporated into NRELs environmental management policies and practices.

4.9 CULTURAL RESOURCES

Impacts to significant cultural resources can occur as a result of building or road construction, utility work, demolition, changes to a resource's setting, or use (including both noise and ground-disturbing activities). This section evaluates potential impacts to cultural resources within the STM and DWOP sites.

Section 106 of the National Historic Preservation Act of 1966 (as amended) requires agencies to consult with the SHPO when making determinations of eligibility and effect for cultural resources within or adjacent to a project. Consultation letters between DOE and SHPO are included Appendix C.

4.9.1 Impacts from Facility and Infrastructure Improvements

Archaeological Resources - No known significant archaeological resources occur within the STM or DWOP sites. Therefore, no impacts are anticipated as a result of the proposed action. However, Zone 6, the 25-acre parcel within Camp George West, has the potential for buried deposits and should be systematically tested prior to construction. Should any evidence of archaeological resources be discovered at any time during ground disturbing activities at the STM site, all work would stop in the vicinity until a qualified archaeologist completely evaluates the significance of the find according to criteria established by the National Register.

Architectural Resources - Two historic resources individually listed on the National Register exist on NREL STM property. In addition, the Camp George West Historic District overlaps the NREL STM property by 25 acres. Two contributing resources occur within those 25 acres. Contributing resources are those features within a historic district that contribute to the districts overall eligibility for the National Register. Improvements resulting from the Proposed Action have the potential to disturb contributing resources to the Historic District. No known cultural resources occur within the DWOP site and therefore no impacts are anticipated.

Ammunitions Igloo (5JF843) **-** The ammunitions igloo is listed on the National Register. It is located in Zone 7. NREL plans no new improvements in this zone. DOE in consultation with the SHPO has determined that no historic properties are affected.

Amphitheater and Foot Bridge (5JF842) - The amphitheater and footbridge are listed on the National Register, and are located in Zone 7. NREL plans no new improvements in this zone. DOE in consultation with the SHPO has determined that no historic properties are affected. If a separate plan to restore the amphitheater and footbridge is proposed in the future, it would be subject to a separate NEPA analysis.

Camp George West Historic District (5JF145) – As shown in Figure 3-9, the Camp George West Historic District includes the 25-acre parcel that was recently deeded to DOE and is referred to as Zone 6 on the STM site. Facility and infrastructure improvements are proposed in Zone 6. Segments of two contributing resources occur within Zone 6:

- Two firing lines (5JF145.66) - The Proposed Action would likely require removal of two firing lines located on NREL property. The firing lines located south of the NREL property would not be affected by the Proposed Action, but will be removed by others as part of the Camp George West Park improvements. DOE, in consultation with the SHPO, has determined that historic properties are adversely affected by the Proposed Action.
- Portions of a low rock wall (5JF145.68) - The Proposed Action would likely require the removal of portions of the low rock wall located on NREL property. The rock wall, located south of the NREL property, would not be affected by the Proposed Action, but will be removed as part of the Camp George West Park improvements. DOE, in consultation with the SHPO, has determined that historic properties are adversely affected by the Proposed Action.

Traditional Cultural Resources – No known traditional cultural resources occur within the STM or DWOP sites. Therefore, no impacts are anticipated as a result of the proposed action.

4.9.2 Impacts of the No Action Alternative

Under the No Action Alternative there would be no ground disturbing activities at the STM site, and any disturbance associated with ongoing operations would be expected to be minor and would be addressed by standard protocol and NREL procedures. Therefore, no historic properties are affected by the No Action alternative.

MITIGATION MEASURES

Consultation with the SHPO to develop final mitigation measures is ongoing. Consistent with Federal law (National Historic Preservation Act, Section 106 and 36 CFR 800.5 and 800.6, DOE and the State Historic Preservation Officer shall negotiate an MOA regarding requirements for identified cultural resources in Zone 6 (See Appendix C).

4.10 HAZARDOUS MATERIALS AND WASTES

Impacts resulting from increased use of hazardous materials and increased generation of hazardous waste are evaluated by examining the types and quantities of materials and wastes, as well as materials and waste management procedures. This section discusses impacts to hazardous materials usage and waste generation resulting from construction, and operational activities resulting from the Proposed Action. It is not possible to quantify the increased amount of hazardous materials that would be used in the future; however, it is likely that the kinds of hazardous materials used will remain substantially the same, consistent with the type of research performed at the STM and DWOP sites. The focus of this section is on the materials and waste management procedures employed by NREL at the STM and DWOP sites.

Increases in hazardous materials use and waste generation would be subject to NREL protocols and State of Colorado regulations. The hazardous waste generator status of the STM and DWOP sites is expected to remain the same; however, if the STM site generator status changes, appropriate changes in management procedures would be implemented in line with State regulations. New facilities and activities are not expected to increase the potential for accidental releases or spills because all existing programs, policies and practices associated with hazardous materials and waste would remain in place to apply to future improvements and activities associated with the Proposed Action. Impacts resulting from increased use of hazardous materials and increased waste generation are expected to be insignificant.

4.10.1 Construction Impacts

Construction operations would be temporary and would occur intermittently over a five-year period. These operations would not significantly increase the amounts or types of hazardous materials maintained at the sites or the amount of hazardous wastes generated at the sites.

In the case of a spill or release of chemicals or hydrocarbons during construction activities, existing BMPs and procedures associated with spill response and materials handling would minimize impacts to surface water. These procedures are defined in the NREL SPCC Plan for the STM site.

4.10.2 Operational Impacts

The Proposed Action would be expected to result in more site activity, potentially increasing the demand for hazardous materials over the current level. In addition, implementation of the Proposed Action could result in requests for the use of new hazardous materials. Hazardous materials would be stored in the newly constructed buildings covering a greater portion of the STM site. None of these issues is expected to be significant because:

- The nature of the research to be performed on the site is not expected to change substantially;
- Chemical manufacturing and processing is not proposed;
- Hazardous materials would continue to be handled centrally through NREL and tracked through the chemical inventory system;
- Waste minimization training and implementation would continue to ensure that the amounts of hazardous materials used on-site would be the least possible, consistent with research objectives;
- NREL's pollution prevention program and other efforts are expected to minimize the amount of hazardous waste generated at both the STM and DWOP sites;
- Substantial changes in hazardous materials usage would be reviewed by NREL's Hazard Identification and Control Program; and
- Stringent management and procedural practices will continue to be implemented at the STM and DWOP sites.

New storage tanks, including a liquid nitrogen storage tank and a hydrogen gas storage tank, all associated with the S&TF, would be constructed and managed in compliance with state, federal, and NREL tank requirements. In the case of a spill or release of chemicals or hydrocarbons during normal operations, existing BMPs and procedures associated with spill response and materials handling would minimize impacts to surface water. These procedures are defined in the NREL SPCC Plan for the STM site.

The proposed S&TF would include the use of several types of gases and fuels, including: liquid nitrogen, hydrogen gas, Silane, argon, and diesel fuel, as well as several types of specialty toxic, highly toxic, and corrosive gases. These latter gases would be stored in a Toxic Gas Room. Silane would be stored in a dedicated Silane storage area on the north side of the building. A toxic gas monitoring system based on that used at the SERF would be installed in the S&TF, with monitoring consisting of a minimum of two points in Laboratories 101, 109, and 110, the Toxic Gas Room, and the Silane bunker. A separate laboratory waste sewer line would connect to all sinks, floor drains, and service trenches in the laboratories, process areas, and service corridors (refer to Section 4.11.4). The potential for accidental release would exist, but would be mitigated to insignificant levels through construction specifications that address safety requirements and implementation of various existing environmental management programs that have been formally adopted by NREL.

Hazardous waste generation would be expected to increase at both the STM and DWOP sites as the quantities of hazardous materials used increases. The amount of hazardous waste generated at the STM site has allowed it to maintain its SQG status; however, the limit for a SQG was exceeded for one month in 1999 when NREL followed the requirements for the Large Quantity Generator (LQG) category. The amount of hazardous waste generated at the STM site over the past several years suggests that future activities would probably not cause the STM site to exceed the SQG limit of 2,20.5 pounds of hazardous waste generated in a single month; however, irregularities in hazardous waste generation amounts at STM reflect the types and kinds of experiments conducted at the site and may vary considerably. NREL procedures would require internal notification if exceedance of the SQG criteria were imminent. NREL would follow the LQG requirements if its SQG status were exceeded for any particular month. The impact of a generator status change is primarily procedural.

Based on the small amount of hazardous waste generated in past years, planned improvements and future activities are not expected to substantially increase the amount of hazardous waste generated at the DWOP site.

Non-regulated waste (ordinary refuse) quantities at the STM site have decreased significantly during the past few years due to proactive waste management and recycling programs. Non-regulated waste at the DWOP is virtually nonexistent. Non-regulated waste levels are expected to increase only slightly and in proportion to increased program activity and the higher number of NREL personnel on the sites. The increase in non-regulated waste would not affect current disposal agreements.

4.10.3 Impacts of the No Action Alternative

If the No Action Alternative were implemented, the quantities and types of hazardous materials and hazardous wastes associated with the site would remain consistent with current amounts.

MITIGATION MEASURES

There are no significant impacts; therefore, no mitigation is necessary.

4.11 PUBLIC SERVICES AND UTILITIES

The following discussion addresses the impacts of the Proposed Action on the capacity of public infrastructure and service providers. Stormwater issues are addressed in Sections 3.6 and 4.6 Water Resources. Broad energy issues are discussed in Sections 3.12 and 4.12 Energy Efficiency and Renewable Energy. Environmental impacts from the construction of new utility infrastructure are discussed throughout Chapter 4, as appropriate.

4.11.1 Electricity and Gas

The increased demand for electricity and gas by the proposed facilities at the STM site is not expected to be substantial with respect to Xcel Energy's overall capacity or local infrastructure. The new demand would not contribute substantially to peak period power demand and associated power generation capacities. However, all additional peak period power demand contributes incrementally toward the cumulative need for new power plants and/or power production and corresponding environmental impacts. These cumulative impacts would be offset by NREL's commitment to sustainability, which includes purchasing "green" power, extensive on-site energy conservation measures, and the potential energy efficiency and renewable energy technology benefits anticipated from the work performed at the STM site (see Sections 3.12 and 4.12 Energy Efficiency and Renewable Energy for related findings). For the proposed S&TF, most internal lighting would consist of a blending of natural and artificial light sources, with control systems including ambient and external light sensing to make this blending as efficient as possible. External lighting for the S&TF would be mostly relegated to ground mounted PV bollards similar to those at the SERF.

4.11.2 Telecommunications

The Proposed Action would improve and extend the on-site telecommunications infrastructure to support new research and development activities, facilities, and an increasing number of employees on the site. No off-site infrastructure requirements are needed and the capacity of local service would not be adversely impacted by the proposed improvements.

4.11.3 Domestic Water System

The Proposed Action would incrementally increase the demand for domestic water and would require modifications and upgrades to the on-site domestic water infrastructure. The capacity of on-site infrastructure would be adequate with contemplated improvements. The current water system would accommodate additional buildings and associated office areas and restroom facilities with the addition of an underground pipe that would be installed from new buildings to the nearest domestic water loop. This improvement would be included in individual building designs.

The long-term water system infrastructure and supplies of the CMWC is considered adequate to serve the site for the foreseeable future (Santangelo, 2003).

4.11.4 Sewage Service

The Proposed Action would increase demand on existing sewer infrastructure and treatment facilities associated with the Pleasant View Water and Sanitation District. The existing on-site system is considered adequate for current and anticipated future sewage needs. The capacity

of the Metro Wastewater Reclamation District's downstream treatment plant in Denver is adequate to accommodate regional sewage needs for the foreseeable future (Isom, 2002).

The S&TF would have two separate waste lines for sanitary waste and laboratory waste. The bathrooms, janitor's closet, mechanical equipment rooms, and break room would connect to the sanitary waste line. The laboratory waste line would connect to all sinks, floor drains, and service trenches in the laboratory, process areas, and service corridors. A sampling station for all lab waste would be installed on the laboratory waste line before it exits the building and ties into the sanitary line. Floor drains in all laboratories would be equipped with a plug or cap that would normally be closed. Due to NREL's "Zero Discharge" policy, acid resistant piping would not be required for the laboratory waste lines.

4.11.5 Emergency Response and Fire Protection

The new facilities and additional staff associated with the Proposed Action would incrementally increase demand for police, fire and ambulance services, but the increases would be considered minor given site use, on-site security, and anticipated needs for emergency service providers.

The Proposed Action would not increase the risk of wildfire on the site, but it would result in the installation of new facilities, equipment, and buildings, as well as the presence of additional people. The NREL Fire Protection Program currently addresses this and other fire risks. The Proposed Action includes fire hydrant requirements and new underground piping to protect new and existing facilities, buildings, equipment and personnel. The fire protection system for the S&TF would be designed to meet the requirements of NFPA 13 for an Ordinary Hazard, Group 2 area. No off-site infrastructure requirements would be needed, and the capacity of on-site and local infrastructure and service would not be disrupted by the proposed improvements or new demands for fire protection services (Abbink, 2002).

4.11.6 Impacts of the No Action Alternative

The No Action Alternative would limit demand growth for public services and utilities by retaining existing employment levels and operational activity at current levels. New facilities and modification and expansion of existing facilities would not occur. Incremental capacity impacts on existing service providers caused by the Proposed Action and the impacts of associated infrastructure improvements would be avoided.

MITIGATION MEASURES

There are no significant impacts; therefore no mitigation measures are necessary.

4.12 ENERGY EFFICIENCY AND RENEWABLE ENERGY

The Proposed Action has a complex impact on energy because it will increase on-site energy demand, generate small amounts of electricity for use on-site, and is expected to contribute substantially to nationwide, and possibly global, use of energy efficiency and renewable energy technology. Overall, the Proposed Action has a beneficial impact on energy efficiency and renewable energy. The following discussion addresses two primary energy impacts of the Proposed Action:

- Electricity Generation;
- Contribution Toward Energy Efficiency and Renewable Energy Technology.

The impacts of the Proposed Action on electricity and gas demand and associated infrastructure is discussed in Section 4.11, Public Utilities and Services.

4.12.1 Electricity Generation for the Site

The Proposed Action increases the potential for the STM site to provide electricity for a portion of its own needs. This is a beneficial impact of the Proposed Action; however, the possibility that the site could become a "power plant" by exporting more electricity than is imported on a sustained basis is extremely remote. The STM site is a laboratory designed for intermittent operations and temporary testing configurations. Given fluctuating and uncertain operational parameters, annual energy consumption is expected to exceed annual energy generation by a considerable margin during the life of the STM site. The STM site is not, and is not intended to become, a renewable energy generation plant or contribute power to the nation's energy grid.

4.12.2 Contribution Toward Energy Efficiency and Renewable Energy Technology

The Proposed Action is fully intended to make a substantial contribution to energy efficiency and renewable energy technology. The magnitude of these beneficial impacts could range from minor to globally significant depending on the technology achievements resulting from the Proposed Action and related efforts worldwide. Clearly, improvements in technology and corresponding cost-effectiveness since the mid-1970s have been substantial, and current energy pricing scenarios and research prospects indicate that further advances may be substantial.

New buildings are expected to include energy efficient designs and systems. For example, the most internal lighting on the S&TF would consist of a blending of natural and artificial light sources, with control systems including ambient and external light sensing to make this blending as efficient as possible. External lighting for the S&TF would be mostly relegated to ground mounted PV bollards similar to those at the SERF.

These direct benefits would also result in indirect and/or secondary beneficial impacts to the environment including, but not limited to, reduced air pollution as compared to emissions generated with conventional energy technologies.

4.12.3 Impacts of the No Action Alternative

The No Action Alternative would maintain the STM site's energy production capacity and energy consumption at current levels. Beneficial energy impacts and corresponding environmental impacts would still be anticipated, but these benefits would be less substantial than those associated with the Proposed Action.

MITIGATION MEASURES

There are no significant impacts; therefore no mitigation is necessary.

4.13 SUMMARY OF SECONDARY AND CUMULATIVE IMPACTS

Secondary impacts are those that are caused by a Proposed Action, but may occur later in time or farther removed in distance, relative to the primary impacts of the Proposed Action. "Cumulative impacts result from the incremental impact of the Proposed Action when added to other past, present, and reasonably foreseeable future actions" (40 CFR Section 1508.7).

This Site-Wide EA considers past, present and reasonable foreseeable short-term and long-term future actions on the STM and DWOP sites. In addition, it considers off-site factors and reasonably foreseeable off-site projects.

Existing development considered in the cumulative impacts analysis include: the construction of the STM facilities; the Colorado State Patrol driver training track facility on South Table Mountain; the surrounding residential, commercial, and government (Jefferson County Government Center and Camp George West) development in the area; and substantial infrastructure improvements such as I-70, C-470, and U.S. Highway 6. The past improvements aggregated together have substantially changed the native conditions of the site and surrounding area. Various impacts such as habitat fragmentation and disruption have occurred incrementally in the area and elsewhere over time. These developments and their impacts are the subject of individual reviews and approvals by government agencies over time. Two examples of regulatory processes associated with related impacts are protections under the Endangered Species Act for sensitive species such as PMJM and protections for wetlands under Section 404 of the Clean Water Act. Other processes are embodied in plans and policies adopted by local governments such as those associated with community plans and development regulation. These issues are discussed in Chapter 4 of this document.

Reasonably foreseeable off-site projects considered in the cumulative impacts analysis include buildout of Denver West Office Park and nearby properties, and secondary development associated with infill and redevelopment that would be anticipated now that the Colorado Mills Mall is open. These projects are not defined specifically at this time, but would be expected to include infill of commercial properties between the STM and DWOP site, commercial development along West Colfax Avenue and South Golden Road, further infill of residential properties in the vicinity of the STM site, and other development in various locations in the area.

Cumulative and secondary impacts are discussed in Sections 4.1 through 4.12, as appropriate. As stated in other locations within Chapter 4, the Proposed Action's incremental contribution to these secondary and cumulative impacts would be insignificant and the No Action alternative would not contribute to these impacts.

The most important examples of secondary and cumulative impacts associated with the Proposed Action are as follows:

- Traffic congestion at the intersections along Denver West Marriott Boulevard;
- Regional and local air pollutant emissions;
- Noise impacts on Pleasant View neighborhoods;
- Development intensification;
- Increases in Lena Gulch stormwater flows;
- Habitat losses from development of natural areas;
- Demand for energy; and

- Beneficial impacts from improved alternative energy sources.

The following discussion explains why the incremental impact of each of the secondary and cumulative impacts is considered insignificant:

Traffic congestion at the intersections along Denver West Marriott Boulevard: The project's incremental impact would leave room for additional development in the vicinity while resulting in adequate LOS. There has been much development in the area, including the Colorado Mills mall. Roads and intersections have been widened and upgraded to accommodate traffic from that project. NREL's proposed action will have an insignificant incremental effect on current traffic levels of service.

Regional and local air pollutant emissions: Air quality in the Denver Metropolitan Area has been poor in the past, but has improved in recent years to the point where the Denver Metropolitan Area has recently been re-designated as an attainment area. The project's incremental impact would not be expected to have any meaningful impact on Denver Metropolitan Area air quality or attainment. However, air pollutant concentrations in the Denver Metro area are relatively close to the standard for ozone and other pollutants, so every source is scrutinized. Given the potential air quality benefits of renewable energy and energy efficiency research to be performed at the site, the overall net impact on cumulative air quality would not be considered significant.

Noise impacts on Pleasant View neighborhoods: Noise generated during construction, from vehicle use on the site, from site operations, and reasonably foreseeable sources is not expected to cause noise levels to exceed any cumulative noise impact standard.

Development intensification: The project includes new development and improvements on the mesa, but does not create unplanned development or present the potential to open up new off-site areas for development. It does not create improved access to real estate, reduce development restrictions, or substantially induce new development in unanticipated areas.

Increases in Lena Gulch stormwater flows: Existing flooding in Lena Gulch is created by an offsite channel constriction on land to become Camp George West Park. This can be resolved with planned modifications under consideration by the Pleasant View Metropolitan District. The Proposed Action would result in a minor increase in stormwater upstream of this constraint, but this stormwater will be detained on site if this improvement is not made in a timely manner.

Habitat losses from development of natural areas: The Proposed Action would not have direct impacts on protected species (PMJM, Ute ladies tresses orchid) or habitats (wetlands) that are the subject of regulations approved to address cumulative impacts on biological resources. However, the project could impact migratory bird species. Mitigation measures would be implemented to address the incremental and cumulative impacts. The indirect impacts of the Proposed Action would be minor with respect to cumulative impacts on biological resources because existing biological values associated with the site are predominantly oriented around the mesa top area, which is preserved in a conservation easement.

Demand for energy and beneficial impacts from improved alternative energy sources: All projects requiring energy have incremental impacts related to energy, but very few offer the possibility of making a positive contribution toward renewable energy and energy efficiency like

a laboratory dedicated to this purpose. The adverse energy impacts of the Proposed Action are at least balanced by the potential beneficial impacts of technology improvements.

Cumulative impacts are important to identify, but characterizing their significance is difficult because these projects are speculative. One example of an external action considered in this cumulative impact analysis is mitigation to be addressed by others for congestion issues on local roads.

4.14 IRREVERSIBLE/IRRETRIEVABLE COMMITMENT OF RESOURCES

An irreversible commitment of resources is defined as the loss of future options. The term applies primarily to the effects of use of nonrenewable resources such as minerals or cultural resources, or to those factors such as soil productivity that are renewable only over long periods. It could also apply to the loss of an experience as an indirect effect of a "permanent" change in the nature or character of the land. An irretrievable commitment of resources is defined as the loss of production, harvest, or use of natural resources. The amount of production foregone is irretrievable, but the action is not irreversible. If the use changes, it is possible to resume production.

The Proposed Action would not have irreversible impacts because future options for using this site would remain possible. A future decommissioning process could restore the site for alternative uses, ranging from natural open space to urban development. No loss of future options would occur.

The primary irretrievable impacts of the Proposed Action would involve the use of energy, labor, materials and funds, and the conversion of some lands from a natural condition through the construction of buildings and facilities. Irretrievable impacts would occur as a result of construction, facility operation and maintenance activities. Direct losses of biological productivity and the use of natural resources from these impacts would be inconsequential.

4.15 THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF THE HUMAN ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

This section addresses the commitment of resources associated with the Proposed Action relative to the loss of long-term productivity associated with these commitments.

The Proposed Action would commit resources in the form of energy, labor, materials, and funds over 20 years or more. The justification for these commitments at this time is described in Section 1.1 Purpose and Need. Long-term productivity associated with the site relates to biological value as habitat and open space values associated with aesthetic quality and recreation. The Proposed Action would involve the use of lands where these values have already been compromised by facility development and operations and would preserve much of the site for these purposes. For these reasons, the incremental loss of biological and open space values would be insignificant. Improved efficiency and increased reliance on renewable energy resources could substantially reduce reliance on coal, oil, and nuclear fuels and reduce resource productivity losses in resource extraction areas.

The Proposed Action would create no long-term risks to public health and safety.

4.16 UNAVOIDABLE ADVERSE IMPACTS

There would be no significant unavoidable adverse impacts of the components of the Proposed Action. However, some adverse impacts would be expected. These impacts and corresponding mitigation measures are described throughout other sections of Chapter 4 and are listed in the Summary of this EA.

4.17 SITE-WIDE ENVIRONMENTAL MANAGEMENT MATRIX

Table 4.4 presents a Site-Wide Environmental Management Matrix. The matrix provides an overview of impact issues associated with individual components of the Proposed Action. The matrix will also serve NREL staff, managers and other decision-makers by providing a quick reference guide for the key issues raised by anticipated improvements at the STM and DWOP sites.
The matrix covers a wide range of issues. These issues and others are managed by NREL under a series of ES&H policies and programs developed and implemented by NREL with oversight provided by DOE. The ES&H policies and programs are well developed and are already integrated into NWTC operations and processes for new projects.

The matrix lists each of the key components of the Proposed Action at the STM and DWOP sites and then compares them to key environmental management issues. The improvements and environmental issues are presented in the same order as they are presented in Chapters 2, 3, and 4 of the EA. If limits on the number, location, or other characteristics of a particular improvement are defined in the EA, those limits or ceilings are noted. If issue clarifications are needed and/or important NEPA "significance" thresholds can be characterized for a particular issue, details are provided in subsequent footnotes.

At this time, no other improvements/changes are anticipated. However, in an effort to improve the utility of this matrix, additional improvements/changes are included in the matrix to guide site managers in the event that unforeseen circumstances warrant changes to the program of improvements.

No mark in the matrix indicates that a particular issue does not relate to a particular improvement. An "X" in the matrix indicates that a particular issue applies or may apply to the corresponding improvement. In many cases, NREL has made commitments related to this issue or has ES&H policies and procedures in place that relate to this issue and may need to be considered as part of project implementation. A red "X" indicates high sensitivity for a particular improvement to the corresponding issue. If an X is present, existing ES&H practices and procedures and corresponding commitments presented in Chapter 1 of the EA should be evaluated to determine whether and how they may apply.

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INSERT TABLE 4.3. SITE-WIDE ENVIRONMENTAL MANAGEMENT MATRIX.

PROGRAM OF IMPROVEMENTS	POTENTIAL ISSUES																													
	Off-Site Land Use Compatibility (1)	Site-Wide Land Use Compatibility (2)	Comp. with Local Planning Policy (3)	Social or Economic Impact	Site Circulation and Parking (2)	Traffic Generation and Congestion (4)	Traffic Safety and Accidents (4)	Air Pollution Constituents (5)	Air Pollution Emissions (5)	Air Quality Attainment Goals (5)	Equipment Noise	Traffic Noise	Visibility and Visual Impact (6)	Surface Water Resources	Ground Water Resources	Storm Water	Soils	Prebles' Meadow Jumping Mouse Habitat (7)	Ute Ladies'-Tresses Orchid Habitat (7)	Wetlands (7)	Cultural Resources (8)	Use of Hazardous Materials (9)	Generation of Hazardous Materials (9)	Disposal of Hazardous Materials (9)	Power Use	Water Use	Sewage Generation	Emergency Services
Construction of New and Modification of Existing Facilities and Research Areas.																														
Science and Technology Facility (S&TF)	X	X	X		X	X	X	X	X		X		X	X	X	X	X			X	X	X	X	X	X	X	X	X	X	X
New laboratories for plant biotechnology and research greenhouses.	X	X	X		X	X	X	X	X		X		X	X		X	X			X	X	X	X	X	X	X	X	X	X	X
Biorefinery pilot-scale facility.	X	X	X		X	X	X	X	X		X		X	X		X	X			X	X	X	X	X	X	X	X	X	X	X
Microbial water-gas shift pilot plant.	X	X	X		X	X	X	X	X		X		X	X		X	X			X	X	X	X	X	X	X	X	X	X	X
Facilities for whole building testing, integrated building/ transportation energy systems, and consolidating staff and laboratory space.	X	X	X		X	X	X	X	X		X		X	X		X	X			X	X	X	X	X	X	X	X	X	X	X
Laboratory facilities for expanded fundamental hydrogen research.	X	X	X		X	X	X	X	X		X		X	X		X	X			X	X	X	X	X	X	X	X	X	X	X
New facility for larger scale hydrogen process development and integration.	X	X	X		X	X	X	X	X		X		X	X		X	X			X	X	X	X	X	X	X	X	X	X	X
Additional space for computing facility and increased connectivity.	X	X	X		X	X	X	X	X		X		X	X		X	X			X	X	X	X	X	X	X	X	X	X	X
Visitor's Center Expansion.	X		X		X	X	X					X	X	X		X	X									X	X	X	X	X
Visitor's Center Parking Expansion.	X	X	X		X	X						X				X										X				X

X=Issue applies or may apply
X(red)=High sensitivity to the issue

PROGRAM OF IMPROVEMENTS	POTENTIAL ISSUES																													
	Off-Site Land Use Compatibility (1)	Site-Wide Land Use Compatibility (2)	Comp. with Local Planning Policy (3)	Social or Economic Impact	Site Circulation and Parking (2)	Traffic Generation and Congestion (4)	Traffic Safety and Accidents (4)	Air Pollution Constituents (5)	Air Pollution Emissions (5)	Air Quality Attainment Goals (5)	Equipment Noise	Traffic Noise	Visibility and Visual Impact (6)	Surface Water Resources	Ground Water Resources	Storm Water	Soils	Prebles' Meadow Jumping Mouse Habitat (7)	Ute Ladies'-Tresses Orchid Habitat (7)	Wetlands (7)	Cultural Resources (8)	Use of Hazardous Materials (9)	Generation of Hazardous Materials (9)	Disposal of Hazardous Materials (9)	Power Use	Water Use	Sewage Generation	Emergency Services
Expansion of Field Test Laboratory Building (FTLB).		X	X		X	X	X	X	X		X		X	X		X	X			X	X	X	X	X	X	X	X	X	X
Zero Energy Building.	X	X	X		X								X	X		X	X			X	X						X	X	X
Small Scale Wind Turbine Research & Development	X	X									X		X													X			
Infrastructure Modifications and Improvements																														
Gray water system.														X	X	X	X		X				X	X		X			
Additional alternative fueling stations.								X	X			X	X	X	X	X	X					X	X	X	X	X	X	X	X	X
Upgrade the Existing Electrical Infrastructure.											X										X					X			
Upgrade and Extend Telecommunications Infrastructure.											X										X								X
Upgrade Existing Domestic Water System.											X			X	X	X					X					X			
Upgrade Fire Protection System.																										X			X
Upgrade Sewage System.											X			X	X	X					X						X		

X=Issue applies or may apply
X(red)=High sensitivity to the issue

Table 4-3. Site-Wide Environmental Management Matrix

PROGRAM OF IMPROVEMENTS	POTENTIAL ISSUES																												
	Off-Site Land Use Compatibility (1)	Site-Wide Land Use Compatibility (2)	Comp. with Local Planning Policy (3)	Social or Economic Impact	Site Circulation and Parking (2)	Traffic Generation and Congestion (4)	Traffic Safety and Accidents (4)	Air Pollution Constituents (5)	Air Pollution Emissions (5)	Air Quality Attainment Goals (5)	Equipment Noise	Traffic Noise	Visibility and Visual Impact (6)	Surface Water Resources	Ground Water Resources	Storm Water	Soils	Prebles' Meadow Jumping Mouse Habitat (7)	Ute Ladies'-Tresses Orchid Habitat (7)	Wetlands (7)	Cultural Resources (8)	Use of Hazardous Materials (9)	Generation of Hazardous Materials (9)	Disposal of Hazardous Materials (9)	Power Use	Water Use	Sewage Generation	Emergency Services
Upgrade and Modify On-Site Roads, Parking Areas, and Site Entrances.	X	X	X				X				X	X	X	X		X	X											X
Security Structures & Equipment	X				X	X	X					X																	X
Operation and Maintenance of New and Modified Facilities																													
Office Work				X		X																				X	X	X	X
Onsite Environmental Monitoring								X	X	X				X	X	X		X	X	X	X	X	X						
Site Amenities		X		X									X																
Fuel Storage and Use		X						X	X														X	X	X				X
Routine Tasks							X				X												X	X	X		X		

X=Issue applies or may apply
X(red)=High sensitivity to the issue

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Footnotes:

1. *Off-Site Land Use Compatibility* – Project requires activities on lands at or beyond the boundaries of the STM site or DWOP buildings. Coordination and/or negotiations with associated property owners and local governments may be a lead item and issues may result that have not been fully addressed by ES&H policies and procedures or commitments in the EA. NEPA could be triggered by substantial controversy or potentially significant off-site impacts that have not been addressed in the EA.

2. *Site-Wide Land Use Compatibility* - Project design elements should be checked with respect to development limitations: building locations, structure heights, setbacks, circulation, access, parking, implications on other projects, etc. Variations in excess of limits or outside of assumed parameters could necessitate NEPA review.

3. *Compatibility with Local Planning Policy* - Site facilities may require local government review despite formal legal authority.

4. *Traffic Congestion and Accidents* - Off-site road improvements and on-site changes that might substantially increase truck traffic, special event traffic volumes, or long-term peak period traffic volumes will necessitate coordination with the Colorado Department of Transportation and local governments.

5. *Air Quality* - Projects that increase air pollutant emissions beyond acceptable thresholds or add one or more new air pollutants to site emissions should be reviewed with respect to emission inventory figures in the associated Air Pollution Emission Notices, Colorado Department of Public Health, Air Pollution Control Division permit thresholds and associated policies, procedures, and committed measures. A significant air pollution impact requiring NEPA review and/or revisiting permits and notifications would be needed if total site-wide emissions exceed permitted limits one or more new harmful pollutants is added to the emission inventory

6. *Visual Quality* - Buildings visible from key public off-site vantage points that exceed the limits defined in Chapter 2 of the EA should be reviewed with respect to visual impacts. A significant visual impact requiring NEPA review would not have specific thresholds, but would require a technical judgment based on the variation from defined limits and potential public reaction to the difference.

7. *Biological Resources* - The following occurrences would be expected to trigger additional NEPA review and/or other specified processes:

- Trapping of a Preble's Meadow Jumping Mouse (PMJM in a new area where surface disturbance is unavoidable and mitigation measures are deemed inadequate by the USFWS. NEPA review and processes associated with the Endangered Species Act would apply.
- Documented presence of Ute ladie's tresses orchid or other protected species in an area where surface disturbance is unavoidable and mitigation measures are deemed inadequate by the USFWS. NEPA review and processes associated with the Endangered Species Act would apply.
- Impacts on wetlands as set forth under Section 404 of the Clean Water Act and associated requirements and guidance. A permit from the USACE may be required.

NEPA review would not be necessary, unless off-site or unusual circumstances and impacts were anticipated.

- Documented mortality of species protected under the Endangered Species Act.

8. *Cultural Resources* - Projects involving earthwork may uncover previously unknown and undocumented cultural resources. If human remains or other substantial resources are encountered, all work must stop and protocol set forth under the Section 106 of the National Historic Preservation Act (NHPA) would apply. The SHPO should be contacted. NEPA review would be unlikely unless impacts were deemed significant and unavoidable.

9. *Hazardous Materials* - Projects that would involve hazardous materials trigger numerous ES&H policies and procedures and require careful review with respect to agency permits notifications. NEPA would not be triggered unless substantial new risks were associated with increasing quantities or new materials. Contact the NREL NEPA Coordinator in the ES&H office.

INSERT FIGURE 4-4 PHOTOS HERE

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Page: 2
[S1]Talk to Maureen. This is 100% of the 20 year forecast, so either the ST&F building needs to be smaller or the cap at 1,000,000 sq. ft. needs to be increased.
Page: 26
[t2]This reference should be modified – figure 2-4 not the same?

5. COMMENTS ON THE DRAFT EA AND RESPONSES

A total of four comment letters (A-D) were received following circulation of the Draft EA. Copies of these letters are presented on the following pages of this section of the Final EA. On each letter are notations that identify specific substantive comments (A.1, A.2, C.2, D.5, etc.) on the Draft EA.

NEPA requires comments on the Draft EA to be considered in this section provides responses to environmental issues raised regarding the environmental effects of the proposed project. Comments that state opinions about the overall merit of the project or comment on the project description are generally not responded to unless a specific environmental issue is raised within the context of the specific comment made. DOE, the decision-maker in relation to the Proposed Action, considers these comments and responses to these comments on the Draft EA.

The following letters were received:

A. United States Department of the Interior, Fish and Wildlife Service, Ecological Services, Colorado Field Office, LeRoy W. Carlson, Colorado Field Supervisor. Letter dated March 27, 2003.

B. Southern Ute Indian Tribe, Tribal Information Services, Edna Frost, Director. Letter dated February 25, 2002.

C. Jefferson County Planning and Zoning Department, Michael Smyth, AICP, Planner. Letter dated April 14, 2003.

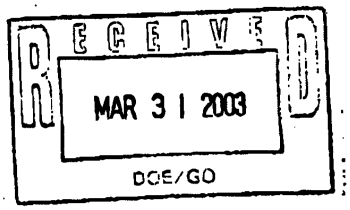
D. Sentinel and Transcript Newspapers, Golden Transcript, Sabrina Henderson, Golden Editor. Email Message March 24, 2003.

The following discussion provides a response to each substantive comment on the Draft EA. Some responses (A.2, C.29, C.31, C.32 and C.41) involved revising the text presented in the Draft EA. The other comments and responses did not require revising the text of the Draft EA. The text of this Final EA includes the entire text of the Draft EA and the appropriate revisions.

A

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
Colorado Field Office
755 Parfet Street, Suite 361
Lakewood, Colorado 80215



IN REPLY REFER TO:
ES/CO: T&E/
Mail Stop 65412

MAR 27 2003

Ms. Roselle Drahushak-Crow
NEPA Document Coordinator
DOE Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

Dear Ms. Drahushak-Crow:

The U.S. Fish and Wildlife Service (Service) received your Draft Environmental Assessment dated March 5, 2003, regarding the proposed addition and operation of the South Table Mountain Complex in Jefferson County, Colorado. These comments have been prepared under the provisions of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et. seq.), the Bald Eagle Protection Act of 1940 (BEPA), as amended (16 U.S.C. 668 et. seq.), and the Migratory Bird Treaty Act of 1918 (MBTA), as amended (16 U.S.C. 703 et. seq.).

Based on the information contained on the disk, the Service believes that the proposed action is not likely to adversely affect any Federally listed species. However, the operation of the complex could have an adverse affect on migratory birds and raptors that utilize the area. Antennas, wind driven turbines and lighting may all have a negative affect on the birds by causing direct mortality and disrupting breeding, nesting and foraging behaviors. In addition, nests may be disturbed during the construction phase and less area will be available for nesting after the complex is completed. The Service recommends that best management practices be implemented to address these issues.

A.1

A.2

Thank you the opportunity to comment on your project. If the Service can be of further assistance, please contact Jeff Peterson at (303) 275-2370.

Sincerely,

LeRoy W. Carlson
Colorado Field Supervisor

B

SOUTHERN UTE INDIAN TRIBE

TRIBAL AFFAIRS BUILDING

RECEIVED
MAR 24 2003
DOE/GO

March 18, 2003

NEPA Document Manger
Attn: Roselle Drahushak-Crow
DOE Field Office
1617 Cole Boulevard
Golden, CO 80401-3393

Subject: National Renewable Energy Laboratory's South Table Mountain Complex (DOE/EA 1440)

Dear Ms. Drahushak-Crow:

I have reviewed your letter of March 5, 2003, and, at this time, believe there are no known impacts to areas of Native American cultural sites that are sensitive to this Tribe in regards to the proposed actions noted on the above location. **B.1** In the event of inadvertent discoveries of Native American sites, artifacts, or human remains, this Tribe would appreciate immediate notification of such findings. **B.2**

Should you require additional comments or have any questions, feel free to contact me, at the number listed below, extension 2209.

Sincerely,

Neil B. Cloud

Neil B. Cloud
NAGPRA Coordinator

Cc: Howard D. Richards Sr., Chairman
Southern Ute Indian Tribe

P.O. Box 737 • 116 Capote Dr. • Ignacio, CO 81137 • Phone: 970-563-0100 • Fax: 970-563-0396

C

Jefferson County Planning and Zoning Department, Michael Smyth, AICP, Planner, April 14, 2003.

April 14, 2003

Roselle Drahushak-Crow
NEPA Document Manager
DOE Golden Field Office
1617 Cole Boulevard
Golden, CO 80401-3393

Re: Draft Site-Wide Environmental Assessment of NREL South Table Mountain Complex (DOE/EA 1440)
Jefferson County Case # 02-015051RP

Review of the materials provided yielded the following comments:

Current Planning:

Development in this area should be compatible with the goals and objectives outlined in the *Jefferson County General Land Use Plan* and the *Jefferson County Zoning Resolution.* **C.1**

The area in question is zoned as an A-2 District within Jefferson County. Any development may be reviewed as a Site Approval process, and the applicable permits obtained for any projects undertaken. **C.2 C.3**

Estimation of traffic impacts within Jefferson County is generally made with a 20-year horizon. County response to traffic generation and future capital project budgets is based in part on these projections. It would be helpful to have traffic and level of service projections for both major and adjacent local intersections. **C.4**

Development in areas with high visual impact is problematic. Introduction of new structures, lighting, and other development activity on the mesa top or in the areas dedicated as conservation easements will have significant impacts. As was noted in the EAS, both local government and the public are sensitive to development that intrudes into the South Table Mountain viewshed as it currently exists. Confining larger structures to Zones 3 through 6 is a thoughtful approach. Limiting the height, bulk, and visibility of structures in Zone 1 is also helpful. **C.5**

Please consider including a member of the Jefferson County Planning and Zoning Department in the Advisory Committee for NREL development. **C.6**

Jefferson County Department of Health and Environment:
We have completed our review of the Environmental Assessment for site wide expansion of NREL and have the following comments and questions about these specific sections:

Page 2-15 Laboratory Gases / Fuels:
The second paragraph describes hydrogen tank storage outside of the building, a dedicated Silane storage area located on the north side of the building, and a liquid storage cylinder site located outside of the building. The applicant needs to describe the methods that will be used to secure the storage areas of these tanks. **C.7**

Page 2-17 Construction of New and Modification of Existing Facilities and Research Areas:
Along with the Spill Prevention Control and Countermeasure (SPCC) Plan, are there any other protective devises to be added to monitor this system? **C.8**

Page 2-21 Operation and Maintenance of New and Modified Facilities:
This section states that environmental monitoring on the site would be performed on an as needed basis and could include the monitoring of off-site control areas. This Departments believes that there should be some type of environmental monitoring done on a continual basis due to the materials stored and used on site. **C.9**

Page 3-25; Section 3.4.2 Existing Noise Levels and Sources:
It appears that even without a study, the noise issues are of concern to NREL. They have identified and researched this issue. Outside of any alterations to the construction process or traffic flows, the noise levels have been addressed. This Department believes that it would be advantageous to the applicant to monitor these levels both during and after the construction process. **C.10** **C.11**

Page 3-59, Section 3.10.1 Hazardous Materials:
Page 3-60, Section 3.10.2 Hazardous and Non-Hazardous Wastes:
NREL has developed a comprehensive plan for waste storage, recycling, and disposal in order to reduce and eliminate waste that must be removed and taken to the landfill. The applicant needs to address how these materials are tracked. **C.12**

Page 3-67, Section 3.11.4 Sewage Disposal System:
The existing mesa top facility has a septic tank and leach field system, which serves one toilet, one hand sink and one janitor's sink. The Jefferson County Department of Health and Environment (JCDHE) has no record of this system. If possible, it would be appreciated if copies of old permits and other associated paperwork would be forwarded to JCDHE at 1801 19th Street, Golden Colorado 80401, to the attention of Mindi Ramig. **C.13**

Page 4-3, Section 4.1.2 Compatibility with Applicable Local Plans, Policies, and Anticipated Future Development:
As stated in the document, local government plans and policies are not applicable to federal lands such as this site. It was explained that South Table Mountain wants to work with local governments and others. They did send out requests for input from these parties concerning the construction. This Department might have missed the fact that the contracted fire service provider was also notified of the changes to the site. From our understanding the contracted agency is West Metro Fire Protection District. We would like to see their comments, or point out to us the section that we missed that includes input from them.

C.14

C.15

Page 4-15, Section 4.3 Air Quality:
If for an unknown reason emissions were to exceed expected ambient air quality standards or substantially impact regional air quality, a tool should be available to notify the Colorado Department of Public Health and Environment (CDPHE) and the JCDHE.

C.16

Page 4-16, Section 4.3.2 Construction Impacts:
NREL's Particulate Emissions Control Plan will be an essential part of the construction process due to the high winds the area is noted to have, which usually blow across the site into residential areas. Their plan has been approved by the State and assigned Permit Number 00JE0009L. Please provide information as to whether this will be monitored on a continual basis after construction.

C.17

Page 4-24, Section 4.6.1 Surface Water and Stormwater Impacts:
This Department did not observe in this section that the Jefferson County Stormwater Coordinator had been consulted by NREL or had reviewed this assessment. We would suggest that a copy of this report be forwarded to the coordinator, Michelle Delaria (303.271.8454), for review and input.

C.18

Page 4-35 SPCC Plan:
NREL has developed a SPCC plan to have on site in the case of spills or releases. No further mention was made as to the amount of training employees would have to implement this plan. It would be advantageous to JCDHE that a copy of this plan and training procedures or policies be forwarded to JCDHE 1801 19th Street Golden, Colorado 80401 to the attention of Mindi Ramig.

C.19

C.20

These were the items that were noted as we reviewed the document, if there are any questions or concerns please feel free to contact us.

Mindi Ramig, REHS
Environmental Health Services Division
Department of Health and Environment
mramig@jeffco.us
303.271.5736
303.271.5760 fx

Zoning Administration:
We do not exercise jurisdiction over any Federal projects, and we would not review any plans or issue any permits on the STM site. The following except is from the document that pertains to the County zoning issue. **C.21**

"4.1.2 Compatibility with Applicable Local Plans, Policies, and Anticipated Future Development
Although the local government plans and policies are not applicable to federal lands such as the STM site, the following discussions compare the proposed development with local government zoning designations and characterize land use and planning issues that future on-site and off-site development may present.

The planned improvements would be considered office or research and development uses, which is inconsistent with the A-2 zoning designation placed on the site by Jefferson County. However, since the proposed uses are consistent with historical and anticipated uses of the site and given that local government policies do not apply to the site, this difference would not be considered a significant impact. In addition, it is anticipated that building setbacks, particularly within Zones 3, 5, and 6, would be generally consistent with local zoning standards and would provide adequate transitions between residential uses and new buildings. These setbacks will vary and will be determined during the site planning process and/or during the final design processes for individual buildings. The conservation easement, as well as utility and trail easements throughout the site, will be preserved. Access via the trail easement corridor through the unsecured portions of the site between the mesa top and off-site residential and park areas will remain open to the public."

Engineering Geologist:
I have reviewed the Draft Site Wide Environmental Assessment for the NREL at South Table Mountain and I have no additional comments.

Long Range Planning:
Recommendations and Comments:

- The General Land Use Plan does not make a specific recommendation for this area. Rather, it is labeled as Camp George West. The proposed expansion does not seem to be out of compliance with the Plan's recommendations or assumption that this area would remain the same type of use as it is currently. **C.22** **C.23**

Site Planning Process…

- We would like a copy of the draft Site Development Plan mentioned in this section. **C.24**

Site Development Zones

- Zone 1 should not allow for additional office or laboratory space. We feel that the expansion of SRRL would cause a lot of community concern and anger. Any facilities or equipment should not be lighted. **C.25**
- Zone 7- Is this area (or will this area be) accessible to the public? How are these cultural resources integrated in the 25-year master plan? **C.26** **C.27**

Science and Technology Facility

- Will the expanded facility be reliant on water from Consolidated Mutual? The EA mentions upgrade of domestic water system (p. 2-20) Did the EA consider the availability of water in the entire region? **C.28** **C.29**

Site Development, Occupancy, and Phasing

- The increase in employment is in compliance with the County's recent efforts to increase the number of jobs in Jefferson County **C.30**

Applicable Local Plans, Policies and Anticipated Future Development
Jefferson County

- The first paragraph is incorrect, as it confuses GLUP with zoning. It should read:

  The Jefferson County General Land Use Plan (GLUP), adopted in 1986, provides policies and land use recommendations for the STM site. GLUP does not provide a specific land use recommendation for the STM site, rather it states the area as Camp George West. The General Land Use Plan is currently being updated, and is expected to be adopted in Fall 2003.

  The STM site is currently zoned A2, which permits "general farming, ranching, intensive agricultural uses and agriculturally related uses while protecting the surrounding land from any harmful effects." The minimum lot size for the A2 zone district is 10 acres. ….

  C.31

- The intent of the PD AMD district in the City of Lakewood is not listed. It would be different than Jefferson County's PD zone district intent. **C.32**

- Lakewood and Golden have an Intergovernmental Agreement designating the areas that will be annexed into either city. The STM site is dissected in this agreement. The County does not compel properties to annex in order to develop. **C.33**

Traffic and Circulation

- Does the traffic study identify the need for access to the main gate from Isabell Street? Does Isabell need to be completed to help traffic flow? Can I get a copy of the traffic study? Completing Isabell Street will be studied in the process for updating GLUP. **C.34**

Cultural Resources

- This section states the DOE/NREL is consulting with the State Historic Preservation Office. I recommend also consulting with Jefferson County Historical Commission. **C.35**

Environmental Consequences
Land Use Impacts

- Who comprises the NREL Design Advisory Board? It may be good to include a representative from Jeffco on this Board (for unclassified project review). **C.36** **C.37**
- A five-story height limit exceeds other uses in the area. A five-story building may block views to South Table Mountain. **C.38** **C.39**
- More thought to the impacts to the existing homes should be included in the EA. This will be a big point of controversy with the public. **C.40**

Social and Economic Impacts

- The EA states that no concentrations of minority or low-income populations are located in the vicinity of the site. This is incorrect. The median household income for the area south of the Visitors Center is $52,422 while the County median household income is $57,339. **C.41**

Matrix
The increase of impervious surfaces does not seem to be considered in the EA or the matrix. Impervious surfaces contribute to non-point pollution, changes to natural drainage flow, ground water recharge, and urban heat. **C.42**

Jefferson County Open Space:
The Open Space Department reviewed this case and had no comments.

Conclusion:
Please call me at 303.271.8719 or e-mail at msmyth@jeffco.us with any questions.

Sincerely,

Michael Smyth, AICP

Sentinel and Transcript Newspapers, Golden Transcript, Sabrina Henderson, Golden Editor, Email Message March 24, 2003. D

-----Original Message-----
From: Sabrina Henderson [mailto:shenderson@jeffconews.com]
Sent: Monday, March 24, 2003 10:14 AM
To: Drahushak-Crow, Roselle; Schmitz, Gary; Public Affairs; Barba, Sarah
Subject: <no subject>

Can someone please give me some information about this proposed new construction on the slope and side of South Table Mountain? I've heard from a stakeholder you all contacted, and I'd like some kind of press release if you have one. Also, please let me know if you have scheduled any public meetings to discuss the proposal. Thanks. **D.1** **D.2**

--
Sabrina Henderson
Golden Editor
Sentinel and Transcript Newspapers
303-279-5541, ext. 233
1000 10th Street, Golden, CO 80401

A. United States Department of the Interior, Fish and Wildlife Service, Ecological Services, Colorado Field Office, LeRoy W. Carlson, Colorado Field Supervisor, March 27, 2003.

A.1 Response: The comment is noted.

A.2 Response: The following response provides additional information about the Migratory Bird Treaty Act and then provides background information, impact findings and mitigation measures in response to this comment. The related text from Sections 3.8 and 4.8 of the Draft EA have been revised as a result of the following response to this comment.

The Migratory Bird Treaty Act implements various treaties and conventions between the U.S. and Canada, Japan, Mexico and the former Soviet Union for the protection of migratory birds. Under the Act, taking, killing or possessing migratory birds is unlawful.
Jefferson County, Colorado encompasses a diverse array of habitats in which 246 bird species have been identified (NDIS, 2000). In and around Golden, Colorado, at least 235 species of birds have been identified and about 90 of those species have been observed on or near North Table Mountain (Foster, 2001). Thirty-five bird species have been identified as present or likely to occur on the STM project area (see Table 3-9). Of these 35 species, 33 are protected under the MBTA, which protects bird species native to North America (USDI/USFWS, 2001). The migratory status of these birds in Colorado includes 20 residents, 5 altitudinal migrants, 7 short distance migrants and 3 neotropical migrants. Additional species, especially during migration, may be present in the STM area. A formal survey of the STM site for migratory birds protected by the MBTA has not been conducted.

Spring migration generally occurs between March and May and fall migration generally occurs between August and October. Migratory bird use on or adjacent to the STM area may include breeding, nesting, foraging, perching and roosting activities. Species most likely to nest in the grasslands include killdeer, common nighthawk, horned lark, and western meadowlark. Species that typically nest in shrubland include green-tailed towhee, Brewer's blackbird, and mourning dove. Other species may nest in trees on or near the STM area including red-tailed hawk, American robin, blue jay, black-capped chickadee, and black-billed magpie.

The STM area provides foraging habitat for all of these species and may be used for perching or roosting by these and other bird species during migration. Raptors may perch on trees while hunting for small mammals and birds located in the grassland and shrubland areas. Other smaller birds, such as the western meadowlark, consume insects that occur in the grassland area.

Breeding generally occurs between May and July. Courtship may begin as early as March for species such as the horned lark. Young birds generally fledge from the nest in August but some species may fledge as late as September (Kingery, 1998).

Best Management Practices

NREL's site planning, decision protocol, and environmental management commitments are described in Section 1.2.3 of the EA. DOE's natural resource commitments are described in Section 1.2.6. In response to potential impacts on migratory bird species, DOE will implement the following BMPs to protect migratory bird species on the site:

- DOE will conduct a field survey of the site for migratory birds and raptors to update existing data and establish general BMPs for the STM site.
- As more specific site plans are developed, DOE will identify any appropriate field surveys needed to clarify potential future impacts and will develop customized BMPs to be applied during and after construction, if necessary. An example of a customized BMP may involve delaying construction until identified nests are no longer being used for the season.

The implementation of these measures is consistent with NREL's overall practices at the STM site and will be incorporated into NRELs environmental management policies and practices.

Table 5-1. Migratory bird species observed and/or likely to be present within National Renewable Energy Laboratory South Table Mountain Site, Golden, Colorado[1]

Common Name	Scientific Name	Migratory Status in Colorado[2]	Nest Site			
			Grass/ ground	Shrub	Tree	Other[3]
American crow	*Corvus brachyrhynchos*	Resident		X	X	
American goldfinch	*Carduelis tristis*	Resident		X	X	
American kestrel	*Falco sparverius*	Resident			X	
American robin	*Turdus migratorius*	Altitudinal migrant			X	
Black-billed magpie	*Pica pica*	Resident			X	
Black-capped chickadee	*Parus atricapillus*	Resident			X	
Blue jay	*Cyanocitta cristata*	Resident			X	
Brewer's blackbird	*Euphagus cyanocephalus*	Altitudinal migrant		X		
Brown-headed cowbird	*Molothrus ater*	Short distance migrant			X	
Chipping sparrow	*Spizella passerina*	Short distance migrant		X	X	
Common nighthawk	*Chordeiles minor*	Neotropical migrant	X			
Common raven	*Corvus corax*	Resident				X
Cooper's hawk	*Accipiter cooperii*	Resident			X	
Dark-eyed junco	*Junco hyemalis*	Resident	X			
European starling[4]	*Sturnus vulgaris*	Resident			X	X
Great-horned owl	*Bubo virginianus*	Resident			X	
Green-tailed towhee	*Pipilo chlorurus*	Short distance migrant		X		
Horned lark	*Eremophila alpestris*	Resident	X			
Killdeer	*Charadruis vociferous*	Altitudinal migrant	X			
Lark bunting	*Calamospiza melanocorys*	Short distance migrant	X			
Lark sparrow	*Chondestes grammacus*	Short distance migrant	X	X		
MacGillivray's warbler	*Oporornis tolmiei*	Neotropical migrant	X	X		
Mountain bluebird	*Sialia currucoides*	Altitudinal migrant			X	
Mourning dove	*Zenaida macroura*	Altitudinal migrant		X		
Northern flicker	*Colaptes auratus*	Resident			X	
Northern harrier	*Circus cyaneus*	Resident	X			

Common Name	Scientific Name	Migratory Status in Colorado[2]	Nest Site			
			Grass/ ground	Shrub	Tree	Other[3]
Prairie falcon	*Falco mexicanus*	Resident				X
Red-tailed hawk	*Buteo jamaicensis*	Resident			X	
Red-winged blackbird	*Euphagus cyanocephalus*	Resident	X	X		
Rock dove[4]	*Columba livia*	Resident				X
Say's phoebe	*Sayornis saya*	Short distance migrant				X
Vesper sparrow	*Pooecetes gramineus*	Short distance migrant	X	X		
Western bluebird	*Sialia mexicana*	Resident foothills			X	
Western kingbird	*Tyrannus verticalis*	Neotropical migrant			X	
Western meadowlark	*Sturnella neglecta*	Resident	X			

1 Sources: NREL (Dames & Moore) 1999; ERO, 1998; NDIS, 2000; Kingery, 1998; Forum, 1987.
2 Sources: Andrews and Righter 1992, DeGraaf and Rappole 1995
3 Other category includes cliffs, manmade structures, etc.
4 Not protected under the Migratory Bird Treaty Act

References:

Andrews, R. and R. Righter. 1992. Colorado Birds: A Reference to their Distribution and Habitat. Denver, Colorado: Denver Museum of Natural History.

DeGraaf, R.M. and J.H. Rappole. 1995. Neotropical Migratory Birds: Natural History, Distribution, and Population Change. Ithaca, New York: Comstock Publishing Associates.

DOE and Dames & Moore. 1999. National Renewable Energy Laboratory Site Conservation Easement Baseline Inventory.

ERO Resources Corporation. 1998. South Table Mountain Conservation Easement Baseline Inventory.

Foster, M. 2001. Birds of the Golden, Colorado Area. Table Mountains Conservation Fund, Inc. Available: http://www.tablemountains.org. (Accessed April 21, 2003).

Kingery, H. 1998. Colorado Breeding Bird Atlas. Denver, Colorado: Colorado Bird Atlas Patrnership and Colorado Division of Wildlife.

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B. Southern Ute Indian Tribe, Tribal Information Services, Edna Frost, Director, February 25, 2002.

B.1 Response: The comment is noted.

B.2 Response: The comment is noted.

C. Jefferson County Planning and Zoning Department, Michael Smyth, AICP, Planner, April 14, 2003.

C.1 Response: Page 3-7 of the Draft EA states the following: "Although the land use plans and policies of local governments are not applicable to federal lands, these plans and policies set forth important affected environment context for the site and surrounding areas. The Draft EA summarizes applicable local government policies and clarifies how the project would relate to those policies. As stated elsewhere in the Jefferson County letter (Comments C.14 and C.21), Jefferson County does not "exercise jurisdiction over any Federal projects."

C.2 Response: The comment is noted (see Response to Comment C.1).

C.3 Response: The comment is noted (see Response to Comment C.1).

C.4 Response: The traffic study conducted as part of this EA process looked at higher occupancy figures than those presented in the EA (see Section 1.5.1). Although speculative, this higher occupancy could represent a 20-year projection. A copy of the traffic study has been provided to Jefferson County.

C.5 Response: The comment is noted. There is no construction proposed in the area designated as a conservation easement. The only development likely in the conservation easement area will be trail construction and maintenance performed by Jefferson County according to the terms of the Conservation Easement Agreement. At this time Jefferson County has not identified any specific trail plans. The visual impact analysis in Section 4.5.1 of the Draft EA is summarized as follows:

The Proposed Action would modify existing facilities and add new features to the STM site that would increase development scale and density at the site, thereby increasing site visibility from numerous off-site vantage points. Although future changes might be noticeable from off-site vantage points, they would not be considered significant adverse visual impacts for the following reasons: 1) the new facilities and features would be reasonably consistent with existing development in the vicinity, 2) views of the mesa top and slopes would not be substantially altered from public vantage points, 3) views from primary public vantage points would not be blocked or substantially degraded, 4) further development of the site as a renewable energy research facility has been anticipated since the STM site was given to DOE by the State of Colorado, and 5) final designs for new development would be subject to review by NREL's DAB and their recommendations would be followed to address visual and aesthetic impacts.

C.6 Response: The comment is noted.

C.7 Response: Information pertaining to NREL's operations and safeguards can be found on NREL's ES&H website at www.nrel.gov/esh. Specific questions pertaining to areas of Jefferson County jurisdiction can be directed to Maureen Jordan, Senior Environmental Engineer, at 303-275-3248.

C.8 Response: Please see response to Comment C.7.

C.9 Response: Please see response to Comment C.7.

C.10 Response: The comment is noted.

C.11 Response: Construction noise impacts are addressed in Seciton 4.4.1 of the Draft EA, and post-construction operational noise is addressed in Section 4.4.2. NREL construction project managers are sensitive to noise issues and the potential affect on neighbors. Outdoor construction activities that generate noise will be conducted only during daylight hours.

C.12 Response: Please see response to Comment C.7.

C.13 Response: Pursuant to State of Colorado requirements for Independent Sewage Disposal Systems with a capacity of less than 2,000 gallons per day, NREL/DOE obtained Jefferson County Permit Number 17787 on September 17, 1998 for the sewage disposal system at the Solar Radiation Research Laboratory. A copy of the permit with the County Engineer's signature certifying final inspection has been sent to the Jefferson County Department of Health and Environment as requested.

C.14 Response: The comment is noted. Please see response to Comment C.1.

C.15 Response: West Metro Fire Protection District (West Metro) is on the distribution list and did receive notification of the Draft EA. West Metro did not provide scoping input and did not comment on the Draft EA. David Abbink, Fire Marshall/Division Chief, provided input to the preparers of the Draft EA in August 2002 (see Sections 3.11.5 and 4.11.5 Emergency Response and Fire Protection). In the referenced conversation, Mr. Abbink stated that no additional off-site infrastructure upgrades would be needed, and the capacity of on-site and local infrastructure and service would not be disrupted by the proposed improvements or new demands for fire protection services.

West Metro routinely inspects the South Table Mountain site and has issued hazardous materials permits to NREL/DOE for every building in which hazardous materials are used or stored.

C.16 Response: Please see response to Comment C.7.

C.17 Response: Following construction, no ambient air monitoring will be conducted. However, inspections by trained NREL staff to prevent particulate emissions will continue until areas disturbed by construction are permanently revegetated or otherwise stabilized. In compliance with NREL/DOE's coverage under EPA's general permit for storm water discharge associated with construction, NREL's Storm Water Pollution Prevention Program requires that all areas disturbed by construction be permanently stabilized to prevent erosion and airborne particulate emissions (See Section 1.2.3).

C.18 Response: Please see response to Comment C.7.

C.19 Response: Please see response to Comment C.7.

C.20 Response: Please see response to Comment C.7.

C.21 Response: The comment is noted. Please see response to Comment C.1.

C.22 Response: The comment is noted.

C.23 Response: The comment is noted.

C.24 Response: The Site Development Plan will be outdated with the completion of the 25-Year General Development Plan (GDP), expected early this summer. NREL will send a copy of the 25-Year GDP to Jefferson County when it is complete.

C.25 Response: The comment is noted. The development planned in Zone 1 is limited and associated with specialized activities such as solar collection and solar radiation (see Sections 2.1.1, 2.1.3 and 2.1.4). The Proposed Action includes potentially expanding the SRRL by approximately 1,350 square feet, one-half of its current size. No other buildings are proposed. The other mesa top components of the proposed action could include equipment and infrastructure modifications. All of these changes will "be of minimal size, low occupancy, and designed for minimal disruption to views of the mesa."

One letter expressing community concern about potential development of the mesa top was received during the scoping process (see Appendix B). Except for this comment from Jefferson County, DOE received no other comments reflecting community concern during the public comment period for the Draft EA.

C.26 Response: There are currently no plans to make Zone 7 accessible to the public.

C.27 Response: NREL has no development plans that would impact these resources and plans to leave them in place as they are today (see Sections 2.1.1, 2.1.3 and 2.1.4).

C.28 Response: As stated in the Final EA, NREL plans to obtain water for the S&TF and other development from Consolidated Mutual (see Sections 3.11.3 and 4.11.3).

C.29 Response: The EA addressed water supply questions based on information available at the time the Draft EA was prepared, including incremental and cumulative impacts on Consolidated Mutual's water supplies (see Sections 3.11.3 and 4.11.3). Based on consultation with Neal Santangelo, Project Engineer with Consolidated Mutual on April 30, 2003, the water supply issue for the S&TF and other future development is as follows:

- Consolidated Mutual has a tap moratorium in place that applies to new users only.
- NREL's STM Complex is an existing user not subject to the tap moratorium.
- Water supplies, taps and service are available for the proposed S&TF and the other STM Complex development described in the Draft EA.

C.30 Response: The comment is noted.

C.31 Response: The text of the Final EA has been revised to include the proposed text recommended by Jefferson County (see Section 3.1.2 of the Final EA).

C.32 Response: The intent of both the Lakewood and Jefferson County PD Districts was discussed in Section 3.1.2 of the Draft EA in the subsection titled, "Jefferson County." In the Final EA, the intent of the PD District in the City of Lakewood has been moved to the subsection titled, "Lakewood, Golden, Denver West, Pleasant View."

C.33 Response: The comment is noted.

C.34 Response: The traffic study indicated that the projected growth rate for the STM Complex over the long term (beyond the 5-year time frame of this EA), DOE would need to consider another access route to help traffic flow, in addition to its current Denver West Parkway main entrance. Completion of Isabell Street would be one possible way for DOE to meet this long-term need. DOE has provided Jefferson County with a copy of the traffic study (see response to Comment C.4), and would like to remain informed on the progress of the County's Isabell Street study.

C.35 Response: Ms. Stephanie O'Hara from the Jefferson County Planning and Zoning Department is the County Liaison for the County's Historical Commission. Ms. O'Hara was contacted on April 30, 2003. Based on this consultation, a letter summarizing the project's related issues and impacts was requested and then submitted to Ms. O'Hara. No further consultation and coordination was requested.

C.36 Response: As described on page 1-15 of the Draft EA, the Design Advisory Board is comprised of professionals in the fields of architecture, landscape, and building design and planning; a member of the Pleasant View community; DOE representatives; and NREL staff.

C.37 Response: The comment is noted.

C.38 Response: The comment is noted.

C.39 Response: The comment is noted. Section 4.5 of the Draft EA states that views from primary public vantage points would not be blocked or substantially degraded. Figure 4-4, photographs 1 and 2, illustrate the approximate perimeter of anticipated development under buildout conditions. The Draft EA states that views of the slopes of South Table Mountain from certain private properties would be blocked and clarifies that those impacts would not be considered significant because development of the site and related infill of the property have been anticipated and the changes would be reasonably consistent with other nearby development on the STM site and elsewhere in the vicinity. Final designs for new development would be subject to review by NREL's DAB, and their recommendations would be followed to address visual and aesthetic impacts.

C.40 Response: The comment is noted. The existence of a substantial controversy over the proposed improvements is not supported by scoping letters or by comment letters on the Draft EA. Please see response to Comment C.25 regarding the absence of letters received expressing community concern.

When specific facilities are proposed in the future, additional visual analysis will be conducted through the NEPA process. This analysis will consider the overall NREL planning process, including the work of the DAB.

C.41 Response: Based on additional consultation with Jefferson County representatives (Newman, 2003), the actual median household income for Census Tract 101 is $40,872, not $52,422 as stated in the letter from Jefferson County. Text in Sections 3.1.4 and 4.1.3 of the Final EA has been modified to indicate that Census Tract 101 should be considered a concentration of low income persons.

C.42 Response: Impacts from increased impervious surface at the STM site were addressed qualitatively within the Draft EA. Section 4.6.1 Surface Water and Stormwater Impacts addresses stormwater quantities, runoff, and surface water quality caused by increases in impervious surface. Related impacts on groundwater were addressed in Section 4.6.2 Groundwater Impacts.

Urban heat was not a relevant issue identified during scoping, so impacts on urban heat from an increase in impervious surface were not addressed in the Draft EA.

D. Sentinel and Transcript Newspapers, Golden Transcript, Sabrina Henderson, Golden Editor, Email Message March 24, 2003.

D.1 Response: Ms. Henderson was contacted by telephone by Mr. John Horst of the DOE Golden Field Office on March 24, 2003. Mr. Horst explained that NREL was opening its Draft STM Site-Wide EA on proposed future development up for public comment. Ms. Henderson determined that she did not need a press release.

D.2 Response: No public meetings were scheduled or held specifically for the purpose of discussing the Draft EA. According to Council on Environmental Quality regulations and DOE NEPA implementing guidance, a public meeting is warranted if there is:

- substantial environmental controversy concerning the proposed action, or
- substantial interest in holding a hearing or meeting, or
- a request for a hearing or meeting by another agency with jurisdiction over the action, supported by reasons why it would be useful (40 CFR 1506.6(c)).

DOE's scoping letter and the comments received are presented in Appendix B of the Final EA. The letter distributing the Draft EA for public comment and comments received are presented in Appendix D of the Final EA. All issues identified by the public during scoping or public review of the Draft EA have been addressed in this Final EA.

DOE holds public meetings on a regular basis for the purpose of discussing NREL's initiatives and site development proposals. These meetings are open to all interested member of the public.

6. LIST OF PREPARERS

The following persons were primarily responsible for preparing this EA.

Steve Blazek, DOE NEPA Compliance Officer.
Maureen Jordan, NREL Senior Environmental Engineer.
Roselle Drahushak-Crow, DOE NEPA Document Manager.

SAIC CONTRIBUTORS		
Name	**Qualifications**	**Primary Responsibilities**
Bonnie Carson	M.S. Environmental Science and Engineering, Colorado School of Mines, B.S., Geology and Geophysics, Missouri School of Mines, B.S., Applied Mathematics and Computer Sciences, Washington University, 14 years of related experience	Task Leader for 3.3 and 4.3 Air Quality, 3.4 and 4.4 Noise and 3.7, 4.7 Geology and Soils, and 3.10 Hazardous Materials and Waste Management
Carlos Jallo	B.A. Environment, Economics, Politics 7 years of related experience	Task Leader for 3.1 and 4.1 Land Use, Planning, Public Policy, Socioeconomics, 3.2 and 4.2 Traffic and Circulation, 3.11 and 4.11 Public Services and Utilities, and 3.12 and 4.12 Energy Efficiency and Renewable Energy
Brian Kennedy, AICP	B.A. Special Major: Environmental Planning and Design, California State University, Chico, 1982. 19 years of experience managing NEPA documentation and doing related technical studies.	Project Manager
Richard McEldowney	B.S. Wildlife Biology M.S. Rangeland Ecosystem Science 6 years of related experience	Task Leader for 3.8 Biological Resources
Tiffany Roberts	B.S. Resource Management 2 years of related experience	Task Leader for 3.5 and 4.5 Visual Quality/Aesthetics
Laura Ziemke	B.A., Anthropology, Boise State University, 1993, 10 years of related experience	Task Leader for 3.9 and 4.9 Cultural Resources

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7.2 AGENCIES AND PERSONS CONSULTED

The following individuals from outside of the U.S. DOE were contacted during the preparation of this EA:

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Current Resident
1490 Golden Hills Rd.
Golden, CO 80401

Current Resident
1491 Golden Hills Rd.
Golden, CO80401

Nancy L. Moss
16600 Golden Hills Rd.
Golden, CO 80401

Gertrude M. Broszat
16630 Golden Hills Rd.
Golden, CO 80401

William L. Aki III
16675 Golden Hills Rd.
Golden, CO 80401

Donna M. Litt
16740 Golden Hills Rd.
Golden, CO 80401

Betty R. Thomas
16820 Golden Hills Rd.
Golden, CO 80401

Stanley W. Baus
645 Isabell St.
Golden, CO 80401

Richard L. Steiner
648 Isabell St.
Golden, CO 80401

Current Resident
655 Isabell St.
Golden, CO 80401

Current Resident
660 Isabell St.
Golden, CO 80401

Current Resident
690 Isabell St.
Golden, CO 80401

Ruth L. Hill
695 Isabell St.
Golden, CO 80401

Current Resident
715 Isabell St.
Golden, CO 80401

Aileen L. Ward
735 Isabell St.
Golden, CO 80401

Dorothy W. Kelly
745 Isabell St.
Golden, CO 80401

Current Resident
760 Isabell St.
Golden, CO 80401

John W. Ertel
762 Isabell St.
Golden, CO 80401

Rita M. Bucholz
765 Isabell St.
Golden, CO 80401

Current Resident
770 Isabell St.
Golden, CO 80401

Norbert M. Janssen
775 Isabell St.
Golden, CO 80401

Clarence N. McCoy
1195 Isabell St.
Golden, CO 80401

Current Resident
1220 Isabell St.
Golden, CO 80401

Stephen J. Walker
1345 Isabell St.
Golden, CO 80401

Colette M. Peters
1423 Isabell St.
Golden, CO 80401

Kenneth D. Malmgren
1465 Isabell St.
Golden, CO 80401

Gail M. Kafara
645 Joyce St
Golden, CO 80401

Current Resident
660 Joyce St.
Golden, CO 80401

James D. Price
635 Joyce St.
Golden, CO 80401

Joyce A. York
640 Joyce St.
Golden, CO 80401

Velma J. Howarter
670 Joyce St.
Golden, CO 80401

Current Resident
680 Joyce St.
Golden, CO 80401

Current Resident
685 Joyce St.
Golden, CO 80401

William J Stokely
700 Joyce St.
Golden, CO 80401

Curtis G. Williams
705 Joyce St.
Golden, CO 80401

Roberta J. Brown
707 Joyce St.
Golden, CO 80401

Nichole Adams
709 Joyce St.
Golden, CO 80401

Monica D. Schwenke
722 Joyce St.
Golden, CO 80401

Connie S. Beumer
740 Joyce St.
Golden, CO 80401

Current Resident
745 Joyce St.
Golden, CO 80401

Jerry J. Duke
755 Joyce St.
Golden, CO 80401

Current Resident
756 Joyce St.
Golden, CO 80401

Jacqueline M. Duke
757 Joyce St.
Golden, CO 80401

Teresa M. Bailey
760 Joyce St.
Golden, CO 80401

Valerie D. Rife
765 Joyce St.
Golden, CO 80401

Current Resident
1325 Joyce St.
Golden, CO 80401

Ethel Oestereick
1450 Joyce St.
Golden, CO 80401

Current Resident
1460 Joyce St.
Golden, CO 80401

Sheila L. Ray
1490 Joyce St.
Golden, CO 80401

Current Resident
618 Juniper St.
Golden, CO 80401

Current Resident
620 Juniper St.
Golden, CO 80401

Current Resident
625 Juniper St.
Golden, CO 80401

Dayleen K. Townsdin
660 Juniper St.
Golden, CO 80401

Carolyn A. King
665 Juniper St.
Golden, CO 80401

Current Resident
670 Juniper St.
Golden, CO 80401

David L. Bell
675 Juniper St.
Golden, CO 80401

Current Resident
680 Juniper St.
Golden, CO 80401

Richard M. Radman
708 Juniper St.
Golden, CO 80401

Dawn E. Blakely
720 Juniper St.
Golden, CO 80401

Current Resident
735 Juniper St.
Golden, CO 80401

Current Resident
741 Juniper St.
Golden, CO 80401

Harold L. & Jean R. Ballard
745 Juniper St.
Golden, CO 80401

Current Resident
752 Juniper St.
Golden, CO 80401

Current Resident
755 Juniper St.
Golden, CO 80401

Current Resident
761 Juniper St.
Golden, CO 80401

Current Resident
761 Juniper St.
Golden, CO 80401

Current Resident
765 Juniper St.
Golden, CO 80401

Susan M. Brown
780 Juniper St.
Golden, CO 80401

Current Resident
790 Juniper St.
Golden, CO 80401

Current Resident
1305 Juniper St.
Golden, CO 80401

Allen V. Rutherford
1340 Juniper St.
Golden, CO 80401

Gilbert R. Dickman
1345 Juniper St.
Golden, CO 80401

Cheryl K. Ray
1355 Juniper St.
Golden, CO 80401

Le Roy F. Lamgo
1395 Juniper St.
Golden, CO 80401

Rebecca L. Johnson
1465 Juniper St.
Golden, CO 80401

Louella M. Ray
1467 Juniper St.
Golden, CO 80401

Sherri A. Wisdom Dickman
1470 Juniper St.
Golden, CO 80401

Current Resident
1480 Juniper St.
Golden, CO 80401

Martin J. Rodriguez
625 Juniper St. #2
Golden, CO 80401

Current Resident
625 Juniper St. #3
Golden, CO 80401

Current Resident
615 Kendrick St.
Golden, CO 80401

Current Resident
620 Kendrick St.
Golden, CO 80401

Wauneta J. Jones
625 Kendrick St.
Golden, CO 80401

Ardis J. Graham
635 Kendrick St.
Golden, CO 80401

Mildred I. Burtlow
655 Kendrick St.
Golden, CO 80401

Joseph C. Dondelinger
656 Kendrick St.
Golden, CO 80401

Virginia L. Dondelinger
658 Kendrick St.
Golden, CO 80401

Current Resident
678 Kendrick St.
Golden, CO 80401

Current Resident
685 Kendrick St.
Golden, CO 80401

Jason L. Springfield
698 Kendrick St.
Golden, CO 80401

Robert L. Mooney, Jr.
705 Kendrick St.
Golden, CO 80401

Current Resident
720 Kendrick St.
Golden, CO 80401

Current Resident
730 Kendrick St.
Golden, CO 80401

Current Resident
735 Kendrick St.
Golden, CO 80401

Edward P. Roy
740 Kendrick St.
Golden, CO 80401

Current Resident
750 Kendrick St.
Golden, CO 80401

Current Resident
780 Kendrick St.
Golden, CO 80401

Current Resident
799 Kendrick St.
Golden, CO 80401

Current Resident
990 Kendrick St.
Golden, CO 80401

Jacquelyn Decoster
1300 Kendrick St.
Golden, CO 80401

Harold E. Ray
1440 Kendrick St.
Golden, CO 80401

Dorothy H. Turner
1460 Kendrick St.
Golden, CO 80401

Gregory S. Wing
1475 Kendrick St.
Golden, CO 80401

Mark D Freeland
626 Moss St.
Golden, CO 80401

Ralph G. Beatty
869 Moss St.
Golden, CO 80401

Kenneth C. Lewis, II
905 Moss St.
Golden, CO 80401

Jay C. Gibbons
925 Moss St.
Golden, CO 80401

Current Resident
970 Moss St.
Golden, CO 80401

Current Resident
970 Moss St.
Golden, CO 80401

Rebecca L. Bell
985 Moss St.
Golden, CO 80401

Charlene L. Kirby
990 Moss St.
Golden, CO 80401

Michael R. Makofske
1002 Moss St.
Golden, CO 80401

Jimmy L. Pridmore
1005 Moss St.
Golden, CO 80401

Current Resident
1010 Moss St.
Golden, CO 80401

Current Resident
1325 Moss St.
Golden, CO 80401

Clint L. Reffel
1355 Moss St.
Golden, CO 80401

Current Resident
1375 Moss St.
Golden, CO 80401

Paul S. Glenn
1395 Moss St.
Golden, CO 80401

Current Resident
805 Nile Ct.
Golden, CO 80401

Current Resident
815 Nile Ct.
Golden, CO 80401

Patricia C. McCall
825 Nile Ct.
Golden, CO 80401

Tiffany D. Riggs
827 Nile Ct.
Golden, CO 80401

Andrew J. Hebein
845 Nile Ct.
Golden, CO 80401

Current Resident
855 Nile Ct.
Golden, CO 80401

Della M. Johnson
895 Nile Ct.
Golden, CO 80401

Current Resident
897 Nile Ct.
Golden, CO 80401

Current Resident
897 Nile Ct.
Golden, CO 80401

Major L. Coleman
695 Nile St.
Golden, CO 80401

John L. Bennett
705 Nile St.
Golden, CO 80401

Current Resident
920 Nile St.
Golden, CO 80401

Michelle C. Hollingsworth
930 Nile St.
Golden, CO 80401

Jeffrey P. Deitchel
940 Nile St.
Golden, CO 80401

Current Resident
960 Nile St.
Golden, CO 80401

Steven M. Ziemann
980 Nile St.
Golden, CO 80401

Carol A. Selbe
1002 Nile St.
Golden, CO 80401

Lois A. Bolter
1005 Nile St.
Golden, CO 80401

Jeffrey A. Gleason
1015 Nile St.
Golden, CO 80401

Timothy J. Klecker
1225 Nile St.
Golden, CO 80401

Ellen G. McFadden
1290 Nile St.
Golden, CO 80401

Jack M. Miller
1310 Nile St.
Golden, CO 80401

Margurite E. Beaman
1350 Nile St.
Golden, CO 80401

Frank R. Yeatts
1395 Nile St.
Golden, CO 80401

David M. Calwil
1425 Nile St
Golden, CO 80401

Loretta A. Arterburn
1490 Nile St.
Golden, CO 80401

Current Resident
775 Nobel St.
Golden, CO 80401

Michael F. Hollingsworth
805 Noble Ct.
Golden, CO 80401

Paula D. Battelli
807 Noble Ct.
Golden, CO 80401

Current Resident
809 Noble Ct.
Golden, CO 80401

Current Resident
811 Noble Ct.
Golden, CO 80401

Donna J. Noble
825 Noble Ct.
Golden, CO 80401

Edith Joan Durant
830 Noble Ct.
Golden, CO 80401

Richard M. Broom
835 Noble Ct.
Golden, CO 80401

Bertha M. Heistuman
840 Noble Ct.
Golden, CO 80401

Gary W. Friskey
850 Noble Ct.
Golden, CO 80401

Courtney S. Sample
855 Noble Ct.
Golden, CO 80401

Rita L. Healy
875 Noble Ct.
Golden, CO 80401

Current Resident
765 Noble St.
Golden, CO 80401

Ruth E. & John S Clute
1062 Noble St.
Golden, CO 80401

Current Resident
1072 Noble St.
Golden, CO 80401

Current Resident
1072 Noble St.
Golden, CO 80401

Current Resident
1125 Noble St.
Golden, CO 80401

Harmon H. Heckart
1130 Noble St.
Golden, CO 80401

Helen L. Price
1240 Orchard Rd.
Golden, CO 80401

Current Resident
675 Orchard St.
Golden, CO 80401

Current Resident
920 Orchard St.
Golden, CO 80401

Heather B. Dill
940 Orchard St.
Golden, CO 80401

Brett E. Pohl
945 Orchard St.
Golden, CO 80401

Current Resident
950 Orchard St
Golden, CO 80401

Current Resident
960 Orchard St.
Golden, CO 80401

Current Resident
970 Orchard St.
Golden, CO 80401

Norma J. Ray
975 Orchard St.
Golden, CO 80401

Janet A. Ray
975 ½ Orchard St.
Golden, CO 80401

Current Resident
980 Orchard St.
Golden, CO 80401

Chad M. Calkins
990 Orchard St.
Golden, CO 80401

Timothy J. Pilger
1015 Orchard St.
Golden, CO 80401

Current Resident
1020 Orchard St.
Golden, CO 80401

Current Resident
1035 Orchard St.
Golden, CO 80401

Michael T. Caldwell
1130 Orchard St.
Golden, CO 80401

Current Resident
1150 Orchard St.
Golden, CO 80401

Current Resident
1185 Orchard St.
Golden, CO 80401

Lewis D. Norlund
1225 Orchard St.
Golden, CO 80401

Sharon A. Rosema
1275 Orchard St.
Golden, CO 80401

June E. Sanford
1325 Orchard St.
Golden, CO 80401

Gregory E. Birney
1345 Orchard St.
Golden, CO 80401

Dorothea C. Nelson
1350 Orchard St.
Golden, CO 80401

Christopher Vigil
1425 Orchard St.
Golden, CO 80401

Michelle A. Fraser
1435 Orchard St.
Golden, CO 80401

Erik M. Vonhalle
1490 Orchard St.
Golden, CO 80401

Gary J. Jeski
1495 Orchard St.
Golden, CO 80401

Alan T. Archer
990 Orchard St.
Golden, CO 80401

Jodi L. Robertson
805 Orion St.
Golden, CO 80401

Current Resident
825 Orion St.
Golden, CO 80401

Karen C. Ljungvall
830 Orion St.
Golden, CO 80401

Current Resident
835 Orion St.
Golden, CO 80401

Current Resident
840 Orion St.
Golden, CO 80401

Current Resident
845 Orion St.
Golden, CO 80401

George A. Potter
860 Orion St.
Golden, CO 80401

John T. Defeo
861 Orion St.
Golden, CO 80401

Current Resident
870 Orion St.
Golden, CO 80401

Anna M. Moffett
885 Orion St.
Golden, CO 80401

Current Resident
890 Orion St.
Golden, CO 80401

Beverly S. Tompkins
895 Orion St.
Golden, CO 80401

Marilyn L. Hamlin
931 Orion St.
Golden, CO 80401

Robert L. Defler
940 Orion St.
Golden, CO 80401

Donald E. Clark
950 Orion St.
Golden, CO 80401

Current Resident
970 Orion St.
Golden, CO 80401

Jacob Bieber
1120 Orion St.
Golden, CO 80401

Connie E. Matson
1125 Orion St.
Golden, CO 80401

Current Resident
1135 Orion St.
Golden, CO 80401

Barbara A. Shaffer
1150 Orion St.
Golden, CO 80401

Nelda B. Ware
1155 Orion St.
Golden, CO 80401

Annabelle R. Garrett
1160 Orion St.
Golden, CO 80401

Current Resident
1170 Orion St.
Golden, CO 80401

Elinor M. Pearce
1180 Orion St.
Golden, CO 80401

Joy S. Pickthall
1185 Orion St.
Golden, CO 80401

Sharon R. Kettler
1190 Orion St.
Golden, CO 80401

Patricia L. Pickthall
1195 Orion St.
Golden, Co 80401

Roxanna J. Conner
P.O. Box 1062
Golden, CO 80401

Barbara J. Eaton
P.O. Box 1203
Golden, Co 80401

Melvin R. Alejandro
P.O. Box 1263
Golden, CO 80401 -1263

Antonio J. Adams
P.O. Box 13735
Golden, CO 80401

Carol M. Jarnutowski
P.O. Box 1546
Golden, CO 80401

Leland L. Durbin
P.O. Box 324
Golden, CO 80401

Leita K. Koch
P.O. Box 333
Golden, CO 80401

Bernadine Morton
P.O. Box 5273
Golden, CO 80401

Larry E. Mossberger
P.O. Box 5295
Golden, CO 80401

Ethyl E. Oestereick
P.O. Box 55
Golden, CO 80401

Harry A. Robertson
P.O. Box 56
Golden, CO 80401

William E. Herrington
P.O. Box 727
Golden, CO 80401

Sheree L. Downs
P.O. Box 805
Golden, CO 80401

Current Resident
1450 Pike St
Golden, CO 80401

Current Resident
1145 Pike St.
Golden, CO 80401

Current Resident
1145 Pike St.
Golden, CO 80401

Debra Reynolds
1160 Pike St.
Golden, CO 80401

Current Resident
1170 Pike St.
Golden, CO 80401

Current Resident
1180 Pike St.
Golden, CO 80401

Theresa L. Lewis
1185 Pike St.
Golden, CO 80401

Current Resident
1205 Pike St.
Golden, CO 80401

Current Resident
1240 Pike St.
Golden, CO 80401

Frank M. McCulla
1270 Pike St.
Golden, CO 80401

Current Resident
1289 Pike St.
Golden, CO 80401

Current Resident
1291 Pike St.
Golden, CO 80401

Christi L. Schaller
1309 Pike St.
Golden, CO 80401

Current Resident
1311 Pike St.
Golden, CO 80401

Current Resident
1346 Pike St.
Golden, CO 80401

Eldon M. Earley
1347 Pike St.
Golden, CO 80401

Mildred L. Earley
1349 Pike St.
Golden, CO 80401

Mary Jo Westhead Vigil
1369 Pike St.
Golden, CO 80401

Dorine M. Warling
1376 Pike St.
Golden, CO 80401

Ann M. Phillips
1389 Pike St.
Golden, CO 80401

Current Resident
1398 Pike St.
Golden, CO 80401

Leonora J. Whiteaker
1408 Pike St.
Golden, CO 80401

Frank R. Seibert
1419 Pike St.
Golden, CO 80401

Kurt J. Butler
1439 Pike St.
Golden, CO 80401

Florence E. Peschiera
1419 Pike St.
Golden, CO 80401

Current Resident
905 Quaker St.
Golden, CO 80401

Current Resident
915 Quaker St.
Golden, CO 80401

Mary A. Warren
930 Quaker St.
Golden, CO 80401

Robert D. Brownlee
990 Quaker St.
Golden, CO 80401

Andrew C. Mott
1033 Quaker St.
Golden, CO 80401

Current Resident
1053 Quaker St.
Golden, CO 80401

Lee E. Eddy
1063 Quaker St.
Golden, CO 80401

Current Resident
1083 Quaker St.
Golden, CO 80401

Current Resident
1103 Quaker St.
Golden, CO 80401

Current Resident
1212 Quaker St.
Golden, CO 80401

Current Resident
1222 Quaker St.
Golden, CO 80401

Current Resident
1232 Quaker St.
Golden, CO 80401

Current Resident
1252 Quaker St.
Golden, CO 80401

Current Resident
1262 Quaker St.
Golden, CO 80401

Current Resident
1305 Quaker St.
Golden, CO 80401

Current Resident
1315 Quaker St.
Golden, CO 80401

Anthony J. Moss
1344 Quaker St.
Golden, CO 80401

Juanita E. Moss
1346 Quaker St.
Golden, CO 80401

Current Resident
1353 Quaker St.
Golden, CO 80401

Nadine O. Sorahan
1354 Quaker St.
Golden, CO 80401

Current Resident
1356 Quaker St.
Golden, CO 80401

Current Resident
1377 Quaker St.
Golden, CO 80401

Lucinda J. Croissant
1380 Quaker St.
Golden, CO 80401

Current Resident
1390 Quaker St.
Golden, CO 80401

Joseph L. Linton
1400 Quaker St.
Golden, CO 80401

Betsy B. Linton
1402 Quaker St.
Golden, CO 80401

Current Resident
1403 Quaker St.
Golden, CO 80401

Current Resident
1450 Quaker St.
Golden, CO 80401

Current Resident
1452 Quaker St.
Golden, CO 80401

Current Resident
1475 Quaker St.
Golden, CO 80401

Current Resident
1485 Quaker St.
Golden, CO 80401

Stanley M. Lupinski
1497 Quaker St.
Golden, CO 80401

Pamela S. McManigal
1498 Quaker St.
Golden, CO 80401

Current Resident
1353 Quaker St. #2
Golden, CO 80401

Current Resident
1353 Quaker St. #3
Golden, CO 80401

Xela H. Ellis
1353 Quaker St. #4
Golden, CO 80401

Timothy D. Councilman
1353 Quaker St.
Golden, CO 80401

Thomas P. Maloney
15601 S. Golden Rd.
Golden, CO 80401

Mary Agnes Moore
15655 S. Golden Rd.
Golden, CO 80401

Current Resident
15969 S. Golden Rd.
Golden, CO 80401

Geraldine L. Lewis
15995 S. Golden Rd.
Golden, CO 80401

Current Resident
16001 S. Golden Rd.
Golden, CO 80401

Current Resident
16001 S. Golden Rd.
Golden, CO 80401

Current Resident
16001 S. Golden Rd.
Golden, CO 80401

Current Resident
16100 S. Golden Rd.
Golden, CO 80401

John W. Fisher
16135 S. Golden Rd.
Golden, CO 80401

Brian A. Beausoleil
16250 S. Golden Rd.
Golden, CO 80401

David J. Christy
16665 S. Golden Rd.
Golden, CO 80401

Current Resident
16700 S. Golden Rd.
Golden, CO 80401

Cynthia K. Sample
16740 S. Golden Rd.
Golden, CO 80401

Current Resident
16745 S. Golden Rd.
Golden, CO 80401

Current Resident
16750 S. Golden Rd.
Golden, CO 80401

Current Resident
16773 S. Golden Rd.
Golden, Co 80401

James F. Johnk
16905 S. Golden Rd.
Golden, CO 80401

Current Resident
16910 S. Golden Rd.
Golden, CO 80401

Julian Clark
16950 S. Golden Rd.
Golden, CO 80401

Current Resident
16985 S. Golden Rd.
Golden, CO 80401

Connie M. Berte
16995 S. Golden Rd.
Golden, CO 80401

Current Resident
16999 S. Golden Rd.
Golden, CO 80401

Current Resident
17005 S. Golden Rd.
Golden, CO 80401

Current Resident
17060 S. Golden Rd.
Golden, CO 80401

Current Resident
17070 S. Golden Rd.
Golden, CO 80401

June N. Lamgo
17075 S. Golden Rd.
Golden, CO 80401

Current Resident
16100 S. Golden Rd.
Golden, CO 80401

Keith A. Thompson
16200 S. Golden Rd. #1
Golden, CO 80401

Current Resident
16100 S. Golden Rd. #13
Golden, CO 80401

Current Resident
16100 S. Golden Rd. #7
Golden, CO 80401

Bobbi J. Levan
16097 S. Golden Rd. A
Golden, CO 80401

Current Resident
16100 S. Golden Rd. #1
Golden, CO 80401

Paul D. Hulett
16100 S. Golden Rd. #14
Golden, CO 80401

Dianna Thomae
16100 S. Golden Rd. #15
Golden, CO 80401

John F. Ferguson
16100 S. Golden Rd. #18
Golden, CO 80401

Current Resident
16100 S. Golden Rd. #2
Golden, CO 80401

Current Resident
16001 S. Golden Rd. #3
Golden, CO 80401

Current Resident
16001 S. Golden Rd. #4
Golden, CO 80401

Current Resident
17190 S. Golden Rd. #47
Golden, CO 80401

Current Resident
16100 S. Golden Rd. #9
Golden, CO 80401

Current Resident
16100 S. Golden Rd. #15
Golden, CO 80401

Current Resident
16097 S. Golden Rd. B
Golden, CO 80401

Current Resident
16200 S. Golden Rd. #2
Golden, CO 80401

Linda G. Watkins
812 Torrey St.
Golden, CO 80401

Larry E. Beery
15795 W. 11th Ave.
Golden, CO 80401

Helene K. Myer
15865 W. 11th Ave.
Golden, CO 80401

Andrea K. Maloney
15875 W. 11th Ave.
Golden, CO 80401

Mary L. Wind
15899 W. 11th Ave.
Golden, CO 80401

Twilla M. Dilworth
16015 W. 11th Ave.
Golden, CO 80401

Current Resident
16508 W. 11th Ave.
Golden, CO 80401

Current Resident
16508 W. 11th Ave.
Golden, CO 80401

Current Resident
16510 W. 11th Ave.
Golden, CO 80401

Current Resident
16545 W. 11th Ave.
Golden, CO 80401

Dyan R. Walcher
16547 W. 11th Ave.
Golden, CO 80401

Current Resident
16565 W. 11th Ave.
Golden, CO 80401

Current Resident
16587 W. 11th Ave.
Golden, CO 80401

Current Resident
16590 W. 11th Ave.
Golden, CO 80401

Current Resident
16605 W. 11th Ave.
Golden, CO 80401

Current Resident
16630 W. 11th Ave.
Golden, CO 80401

Peter J. Watkins
16650 W. 11th Ave.
Golden, CO 80401

Current Resident
16675 W. 11th Ave.
Golden, CO 80401

Current Resident
16680 W. 11th Ave.
Golden, CO 80401

Bonnie B. Palmateer
16682 W. 11th Ave.
Golden, CO 80401

Current Resident
16690 W. 11th Ave.
Golden, CO 80401

Gregory S. Cameron
16700 W. 11th Ave.
Golden, CO 80401

Daniel D. Hollingsworth
16700 W. 11th Ave.
Golden, CO 80401

Current Resident
16701 W. 11th Ave.
Golden, CO 80401

Margaret R. Bruckner
16900 W. 11th Ave.
Golden, CO 80401

Peggy M. Kuretich
16905 W. 11th Ave.
Golden, CO 80401

Rochelle L. Kuretich
16907 W. 11th Ave.
Golden, CO 80401

Chad S. Turner
16925 W. 11th Ave.
Golden, CO 80401

Dennis R. Bandy
16940 W. 11th Ave.
Golden, CO 80401

Catherine D. Phelps
16970 W. 11th Ave.
Golden, CO 80401

Deron S. Dilger
16980 W. 11th Ave.
Golden, CO 80401

Current Resident
16999 W. 11th Ave.
Golden, CO 80401

Leona F. Hobbs
17003 W. 11th Dr.
Golden, CO 80401

Current Resident
17004 W. 11th Dr.
Golden, CO 80401

Peggy B. Allen
17006 W. 11th Dr.
Golden, CO 80401

Current Resident
17035 W. 11th Dr.
Golden, CO 80401

Current Resident
17036 W. 11th Dr.
Golden, CO 80401

Current Resident
17053 W. 11th Dr.
Golden, CO 80401

Current Resident
17054 W. 11th Dr.
Golden, CO 80401

Current Resident
17055 W. 11th Dr.
Golden, CO 80401

Gary W. Truman
17056 W. 11th Dr.
Golden, CO 80401

Fred Martin
15825 W. 11th Pl.
Golden, CO 80401

David H. Borgelt
15864 W. 11th Pl.
Golden, CO 80401

Gordon J. Kennedy
15869 W. 11th Pl.
Golden, CO 80401

Current Resident
17009 W. 11th Pl.
Golden, CO 80401

Marie H. Simon Connally
17010 W. 11th Pl.
Golden, CO 80401

Current Resident
17029 W. 11th Pl.
Golden, CO 80401

Current Resident
17030 W. 11th Pl.
Golden, CO 80401

Craig D. Roik
17032 W. 11th Pl.
Golden, CO 80401

Current Resident
17049 W. 11th Pl.
Golden, CO 80401

Crystal Adams
17050 W. 11th Pl.
Golden, CO 80401

Amanda J. Fox
17051 W. 11th Pl.
Golden, CO 80401

Current Resident
16935 W. 11th. Ave.
Golden, CO 80401

Paul E. Maloney
15806 W. 12th Ave.
Golden, CO 80401

Richard H. Matthews, Sr.
16091 W. 12th Ave.
Golden, CO 80401

Elizabeth H. Scheiding
16121 W. 12th Ave.
Golden, CO 80401

Constance L. Gerstner
16141 W. 12th Ave.
Golden, CO 80401

Todd A. Isom
16160 W. 12th Ave.
Golden, CO 80401

Vernon A. Loyd
16181 W. 12th Ave.
Golden, CO 80401

Current Resident
16930 W. 12th Ave.
Golden, CO 80401

Current Resident
16940 W. 12th Ave.
Golden, CO 80401

Current Resident
16950 W. 12th Ave.
Golden, CO 80401

Current Resident
16960 W. 12th Ave.
Golden, CO 80401

Current Resident
16991 W. 12th Ave.
Golden, CO 80401

Margot A. Plummer
17001 W. 12th Ave.
Golden, CO 80401

Current Resident
17005 W. 12th Ave.
Golden, CO 80401

Raymond E. Declue
17015 W. 12th Ave.
Golden, CO 80401

Michael S. Foss
17016 W. 12th Ave.
Golden, CO 80401

Current Resident
17046 W. 12th Ave.
Golden, CO 80401

Portia H. Masterson
17076 W. 12th Ave.
Golden, CO 80401

Mildred M. Nelson
17155 W. 12th Ave.
Golden, CO 80401

Randy J. Anderson
17165 W. 12th Ave.
Golden, CO 80401

Current Resident
17225 W. 12th Ave.
Golden, CO 80401

Andrew E. Price
17215 W. 12th Ave. #3
Golden, CO 80401

Jeanmarie C. Mulnix
17205 W. 12th Ave. #1
Golden, CO 80401

Current Resident
17225 W. 12th Ave. #1
Golden, CO 80401

Current Resident
17225 W. 12th Ave. #14
Golden, CO 80401

Current Resident
17225 W. 12th Ave. #15
Golden, CO 80401

Current Resident
17225 W. 12th Ave. #3
Golden, CO 80401

Current Resident
17215 W. 12th Ave. #4
Golden, CO 80401

Current Resident
17225 W. 12th Ave. #6
Golden, CO 80401

Current Resident
17225 W. 12th Ave. #8
Golden, CO 80401

Current Resident
17215 W. 12th Ave. #1
Golden, CO 80401

Current Resident
17225 W. 12th Ave. #10
Golden, CO 80401

Current Resident
17225 W. 12th Ave. #5
Golden, CO 80401

Current Resident
17225 W. 12th Ave. #7
Golden, CO 80401

Current Resident
17225 W. 12th Ave. #2
Golden, CO 80401

Current Resident
16465 W. 12th Dr.
Golden, CO 80401

Current Resident
16470 W. 12th Dr.
Golden, CO 80401

Current Resident
16473 W. 12th Dr.
Golden, CO 80401

Current Resident
16475 W. 12th Dr.
Golden, CO 80401

Current Resident
16485 W. 12th Dr.
Golden, CO 80401

Arlen E. Zens
16500 W. 12th Dr.
Golden, CO 80401

Bradley J. Hoover
16508 W. 12th Dr.
Golden, CO 80401

Joseph E. Begeman
16515 W. 12th Dr.
Golden, CO 80401

Current Resident
16520 W. 12th Dr.
Golden, CO 80401

Stephen D. Schwochow
16493 W. 12th Pl.
Golden, CO 80401

Jerrilynn Tucker
16535 W. 12th Pl.
Golden, CO 80401

Carl D. Loht
16577 W. 12th Pl.
Golden, CO 80401

Carole L. Korosec
16585 W. 12th Pl.
Golden. CO 80401

Rochelle A. Labout
16600 W. 12th Pl.
Golden, CO 80401

Glenn C. Miller
16650 W. 12th Pl.
Golden, CO 80401

Current Resident
16652 W. 12th Pl.
Golden, CO 80401

Current Resident
16655 W. 12th Pl.
Golden, CO 80401

Current Resident
14935 W. 13th Ave.
Golden, CO 80401

Donna W. Unruh
15001 W. 13th Ave.
Golden, CO 80401

Current Resident
15013 W. 13th Ave.
Golden, CO 80401

Margo A. Green
15090 W. 13th Ave.
Golden, CO 80401

Current Resident
15100 W. 13th Ave.
Golden, CO 80401

Kerry J. Lidster
15150 W. 13th Ave.
Golden, CO 80401

Current Resident
15150 W. 13th Ave.
Golden, CO 80401

Mary J. Fleming
15700 W. 13th Ave.
Golden, CO 80401

Current Resident
15705 W. 13th Ave.
Golden, CO 80401

Terri L. Feldkamp
15776 W. 13th Ave.
Golden, CO 80401

Current Resident
15800 W. 13th Ave.
Golden, CO 80401

Adrienne E. Bergstrom
15805 W. 13th Ave.
Golden, CO 80401

Vicki L. Noeth
15830 W. 13th Ave.
Golden, CO 80401

Phillip J. Paulter
15835 W. 13th Ave.
Golden, CO 80401

Margaret H. Dee
15850 W. 13th Ave.
Golden, CO 80401

Katherine L. Porter
15855 W. 13th Ave.
Golden, CO 80401

Current Resident
15880 W. 13th Ave.
Golden, CO 80401

Curtis H. Erickson
15900 W. 13th Ave.
Golden, CO 80401

Nora D. Bates
15905 W. 13th Ave.
Golden, CO 80401

Ann B. Hansen
15930 W. 13th Ave.
Golden, CO 80401

Anne J. Schuster
15935 W. 13th Ave.
Golden, CO 80401

Lynne M. Otool
15985 W. 13th Ave.
Golden, CO 80401

Jean E. Hanna
16042 W. 13th Ave.
Golden, CO 80401

Ann R. Mills
16043 W. 13th Ave.
Golden, CO 80401

Andrew L. George
16092 W. 13th Ave.
Golden, CO 80401

Current Resident
16093 W. 13th Ave.
Golden, CO 80401

Current Resident
16122 W. 13th Ave.
Golden, CO 80401

Current Resident
16123 W. 13th Ave.
Golden, CO 80401

Shawn M. Yasutake
16142 W. 13th Ave.
Golden, CO 80401

Marlene A. Pates
16162 W. 13th Ave.
Golden, CO 80401

Lucas J. Santilli
16163 W. 13th Ave.
Golden, CO 80401

Chester L. Stockton
16182 W. 13th Ave.
Golden, CO 80401

Colleen M. Olson
16210 W. 13th Ave.
Golden, CO 80401

Darlene M. Besser
16213 W. 13th Ave.
Golden, CO 80401

William W. Clark, III
16215 W. 13th Ave.
Golden, CO 80401

Courtney R. Armenta
16230 W. 13th Ave.
Golden, CO 80401

Marilyn V. Bergan
16233 W. 13th Ave.
Golden, CO 80401

Kay E. Taylor
16235 W. 13th Ave.
Golden, CO 80401

Current Resident
16250 W. 13th Ave.
Golden, CO 80401

Current Resident
16252 W. 13th Ave.
Golden, CO 80401

Rebecca L. Rundquist
16253 W. 13th Ave.
Golden, CO 80401

Diane H. Mullin
16255 W. 13th Ave.
Golden, CO 80401

Byron E. Sauve
16270 W. 13th Ave.
Golden, CO 80401

Patricia A. Roe
16272 W. 13th Ave.
Golden, CO 80401

Current Resident
16273 W. 13th Ave.
Golden, CO 80401

Roni M. Zurcher
16275 W. 13th Ave.
Golden, CO 80401

Christine D. Parkhurst
16292 W. 13th Ave.
Golden, CO 80401

Tina F. Gabel
16293 W. 13th Ave.
Golden, CO 80401

Current Resident
16294 W. 13th Ave.
Golden, CO 80401

Elma Lumbert
16295 W. 13th Ave.
Golden, CO 80401

Erick M. Bartosh
16340 W. 13th Ave.
Golden, CO 80401

Current Resident
15150 W. 13th Ave. E
Golden, CO 80401

Current Resident
16267 W. 13th Pl
Golden, CO 80401

David B. Falls
15880 W. 13th Pl.
Golden, CO 80401

Current Resident
15890 W. 13th Pl.
Golden, CO 80401

Cathy J. Crane
15895 W. 13th Pl.
Golden, CO 80401

Roy E. Morton, Jr.
15925 W. 13th Pl.
Golden, CO 80401

Chester A. Hurley, Jr.
15930 W. 13th Pl.
Golden, CO 80401

Current Resident
15940 W. 13th Pl.
Golden, CO 80401

Roy E. Bergquist
15970 W. 13th Pl.
Golden, CO 80401

Current Resident
15980 W. 13th Pl.
Golden, CO 80401

Morris D. Lund
16044 W. 13th Pl.
Golden, CO 80401

Michael G. Spak
16045 W. 13th Pl.
Golden, CO 80401

Sondra K. Simmons
16094 W. 13th Pl.
Golden, CO 80401

Current Resident
16095 W. 13th Pl.
Golden, CO 80401

Frieda D. Wypyhoski
16124 W. 13th Pl.
Golden, CO 80401

Linda L. Hughes
16125 W. 13th Pl.
Golden, CO 80401

Karen M. Brungardt
16144 W. 13th Pl.
Golden, CO 80401

Cherie L. Hudson
16145 W. 13th Pl.
Golden, CO 80401

Xi Xi
16164 W. 13th Pl.
Golden, CO 80401

La Vonne E. Benjamin
16165 W. 13th Pl.
Golden, CO 80401

Greta I. Alenius
16184 W. 13th Pl.
Golden, CO 80401

Betty D. Batholomew
16185 W. 13th Pl.
Golden, CO 80401

Gregory W. Williams
16266 W. 13th Pl.
Golden, CO 80401

Veralynn A. Mecham
16268 W. 13th Pl.
Golden, CO 80401

Robert H. Jr. Kelder
16296 W. 13th Pl.
Golden, CO 80401

Vonda M. Alden
16298 W. 13th Pl.
Golden, CO 80401

Robert L. Cain
16299 W. 13th Pl.
Golden, CO 80401

Michael J. Bye
16338 W. 13th Pl.
Golden, CO 80401

Gail L. Pratt
16339 W. 13th Pl.
Golden, CO 80401

Mary J. Gray
16340 W. 13th Pl.
Golden, CO 80401

Craig D. Petersen
16370 W. 13th Pl.
Golden, CO 80401

Joseph R. Detaranto, III
15975 W. 13th Pl.
Golden, CO 80401

Michael P. Rosenthal
15760 W. 14th Ave
Golden, CO 80401

Lenora E. Wichmann
14985 W. 14th Ave.
Golden, CO 80401

Ethelmae Quayle
15005 W. 14th Ave.
Golden, CO 80401

Colleen N. Crocker
15101 W. 14th Ave.
Golden, CO 80401

Dorothy K. Roberts
15160 W. 14th Ave.
Golden, CO 80401

Julie R. Gerdes
16241 W. 14th Ave.
Golden, CO 80401

Shauna A. Johnsonn
16251 W. 14th Ave.
Golden, CO 80401

Jim J. Verstraten
16260 W. 14th Ave.
Golden, CO 80401

Debra L. Waller
16271 W. 14th Ave.
Golden, Co 80401

Sean S. Griffith
16280 W. 14th Ave.
Golden, CO 80401

Robert Wilber
16281 W. 14th Ave.
Golden, CO 80401

Brett E. Miner
16300 W. 14th Ave.
Golden, CO 80401

Glendlyn S. Hogan
16301 W. 14th Ave.
Golden, CO 80401

Erica N. Enright
16310 W. 14th Ave.
Golden, Co 80401

Michael J. Enright
16325 W. 14th Ave.
Golden, CO 80401

Bonnie J. Bartosh
16341 W. 14th Ave.
Golden, CO 80401

Judith M. Hankin
16345 W. 14th Ave.
Golden, Co 80401

Current Resident
16350 W. 14th Ave.
Golden, CO 80401

Janine Rowsey
16351 W. 14th Ave.
Golden, CO 80401

Susan M. Saegel
16359 W. 14th Ave.
Golden, CO 80401

Joseph R. Leger
15800 W. 14th Pl.
Golden, CO 80401

Laura A. Longrigg
15805 W. 14th Pl.
Golden, CO 80401

Cindy L. ORiley
15830 W. 14th Pl.
Golden, CO 80401

Current Resident
15850 W. 14th Pl.
Golden, CO 80401

Current Resident
15875 W. 14th Pl.
Golden, CO 80401

Current Resident
15875 W. 14th Pl.
Golden, CO 80401

Current Resident
15880 W. 14th Pl.
Golden, CO 80401

Mark A. Earhart
15895 W. 14th Pl.
Golden, CO 80401

Robert B. Johnson
15895 W. 14th Pl.
Golden, CO 80401

Clyde M. Harber
15900 W. 14th Pl.
Golden, CO 80401

Janice E. Weaver
15905 W. 14th Pl.
Golden, CO 80401

Current Resident
15920 W. 14th Pl.
Golden, CO 80401

Gloria M. Splant
15925 W. 14th Pl.
Golden, CO 80401

Current Resident
15950 W. 14th Pl.
Golden, CO 80401

Todd A. Hunter
15955 W. 14th Pl.
Golden, CO 80401

Current Resident
15995 W. 14th Pl.
Golden, CO 80401

Harry A. Huizenga
16005 W. 14th Pl.
Golden, CO 80401

Cynthia J. Charbonneau
16030 W. 14th Pl.
Golden, CO 80401

Current Resident
16035 W. 14th Pl.
Golden, CO 80401

Current Resident
16035 W. 14th Pl.
Golden, CO 80401

Veronica A. Yada
16035 W. 14th Pl.
Golden, CO 80401

Helen E. Meacham
16070 W. 14th Pl.
Golden, CO 80401

Claude D. Briles
16075 W. 14th Pl.
Golden, CO 80401

Claribelle E. Stow
16090 W. 14th Pl.
Golden, CO 80401

Current Resident
16095 W. 14th pl.
Golden, CO 80401

Amy M. Stow
16100 W. 14th Pl.
Golden, CO 80401

Bert L. Denison
16105 W. 14th Pl.
Golden, CO 80401

Jennifer R. Airhart
16130 W. 14th Pl.
Golden, CO 80401

Frances A. Leadford
16135 W. 14th Pl.
Golden, CO 80401

Current Resident
16150 W. 14th Pl.
Golden, CO 80401

Barbara L. Riley
16155 W. 14th Pl.
Golden, CO 80401

Current Resident
16185 W. 14th Pl.
Golden, CO 80401

Current Resident
16435 W. 14th Pl.
Golden, CO 80401

Current Resident
16450 W. 14th Pl.
Golden, CO 80401

David A. Orosz
16707 W. 14th Pl.
Golden, CO 80401

Laura E. Degroat
16824 W. 14th Pl.
Golden, CO 80401

Deborah K. Powell
16832 W. 14th Pl.
Golden, CO 80401

Miguel Cardoso
16838 W. 14th Pl.
Golden, CO 80401

Current Resident
16858 W. 14th Pl.
Golden, CO 80401

Current Resident
16859 W. 14th Pl.
Golden, CO 80401

Current Resident
16860 W. 14th Pl.
Golden, CO 80401

Current Resident
16868 W. 14th Pl.
Golden, CO 80401

Lori A. Belfor
16870 W. 14th Pl.
Golden, CO 80401

Rachael M. Gonzales
16890 W. 14th Pl.
Golden, CO 80401

Nancy M. Saxton
1500 W. 15th Ave.
Golden, CO 80401

Edwin L. Saxton
15000 W. 15th Ave.
Golden, CO 80401

Barbara A. Morris
16520 W. 15th Ave.
Golden, CO 80401

Robert W. Morris
16525 W. 15th Ave.
Golden, CO 80401

Current Resident
16725 W. 15th Ave.
Golden, CO 80401

Current Resident
16735 W. 15th Ave.
Golden, CO 80401

Timothy B. Sigwarth
16740 W. 15th Ave.
Golden, CO 80401

James L. Johnston
16745 W. 15th Ave.
Golden, CO 80401

Current Resident
16775 W. 15th Ave.
Golden, CO 80401

Current Resident
16777 W. 15th Ave.
Golden, CO 80401

Current Resident
16785 W. 15th Ave.
Golden, CO 80401

Sandra J. Miorelli
16840 W. 15th Ave.
Golden, CO 80401

Chris E. Wilson
16880 W. 15th Ave.
Golden, CO 80401

Pamella S. McDowell
16885 W. 15th Ave.
Golden, CO 80401

Michael A. Lynam
16930 W. 15th Ave.
Golden, CO 80401

Connie E. Regner
16970 W. 15th Ave.
Golden, CO 80401

Brian R. Pamperin
16860 W. 15th Ave. A
Golden, CO 80401

Current Resident
16727 W. 15th St.
Golden, CO 80401

Lyle H. McClure
16080 W.12th Ave.
Golden, CO 80401

Mr. & Mrs. Charles Barrick
11127 Plainview Rd.
Golden, CO 80403

Teresa Bath
500 Corp. Circle #A
Golden, CO 80401

Ms. Maggie Hudson
513 Mt. Evans Rd.
Golden, CO 80401

Mr. Daniel Hayes
5115 Easly Rd.
Golden, CO 80403

Neal Lynch
500 Corp. Circle #A
Golden, CO 80401

Sandra Newkirk
13257 W. 26th Avenue
Golden, CO 80401

Mr. LeRoy W. Carlson
US Fish and Wildlife Service
Colorado Field Office
P.O. Box 25486
Denver, CO 80225-0207

Bureau of Land Management
Environmental Compliance Office
2850 Youngfield Street
Lakewood, CO 80215

Mr. Terry McKee
Dept. of Army, Corps of Engineers
Omaha District
9307 State Highway 121
Littleton, CO 80123

Ms. Grace Fink
Office of Representative
Dan Schaefer
5965 Yukon
Arvada, CO 80004

Senator Ed Perlemutter
370 17th Street
28th Floor
Denver, CO 80202-5626

Ms. Linda Coulter
Colorado Department of Agriculture
700 Kipling Street, Suite 4000
Lakewood, CO 80215

Mr. Lew Ladwig
Colorado Geological Survey
1313 Sherman Street, Rm 715
Denver, CO 80203

Mr. Gerald Craig
State Raptor Biologist
Colorado Division of Wildlife
317 Prospect Road
Fort Collins, CO 80526

Mr. Glen Anderson
Colorado Association of Soil
Conservation Districts
3000 Youngfield, Suite 163
Lakewood, CO 80215

Ms. Karen Hellner
Jefferson Co. Planning & Zoning Off.
700 Jefferson County Pkwy, Suite 3550
Golden, CO 80419-3550

Mr. Timothy Carey
Dept. of Army, Corps of Engineers
Omaha Dist./Tri-Lakes Project Office
9307 State Highway 121
Littleton, CO 80123

Ms. Carol Campbell
Dir. Ecosystem Protection
US EPA – Region VIII
999 18th Street, Suite 500
Denver, CO 80202-2405

Colorado State Board of Land Comm.
1313 Sherman Street, Rm 620
Denver, CO 80203

Colorado Department of Public Health &
Environment
Haz. Materials & Waste Mgmt Div.
4300 Cherry Creek Drive, South
Denver, CO 80246-1530

Mr. Perry Olson
Colorado Division of Wildlife
6060 Broadway
Denver, CO 80216

Mr. Curt Eckhart
Region 6 Office
Colorado Department of Transportation
2000 South Holly Street
Denver, CO 80222

Colorado Single Point of Contact
Division of Local Government
1313 Sherman Street, Rm 521
Denver, CO 80203

Mr. Bob Storterant
Colorado State Forest Service
203 Forestry Bldg., CSU
Fort Collins, CO 80523

Colorado Wildlife Federation
P.O. Box 280967
Lakewood, CO 80228

Ms. Doris DePenning
Friends of the Foothills
9285 Blue Mountain Dr.
Golden, CO 80403

Ms. Nancy Hollinger
Friends of the Foothills
9184 Fern Way
Golden, CO 80402

Mr. David Abelson
Rocky Flats Coalition of Local
Government
8461 Turnpike Dir
Westminster, CO 80031

Ecological Science Dept.
Soil Conservation Service
655 Parfet Street, Rm E20C
Lakewood, CO 80215

Ms. Belinda Boiko
Yenter Companies
20300 W. Highway 72
Arvada, CO 80007

Governor Bill Owens
State of Colorado
136 State Capitol
Denver, CO 80203

Mr. Ed Backstrom
Conservation Districts
Colorado Association of Soil
3000 Youngfield, Suite #163
Lakewood, CO 80215

Ecolological Science Dept.
Soil Conservation Service
655 Parfet Street Room E20C
Lakewood, CO 80215

Mr. Jim Miller
Dir. of Policy & Communication
CO Dept. of Agriculture
700 Kipling Street, Suite 4000
Lakewood, CO 80215

Environmental Compliance Office
Bureau of Land Management
2850 Youngfield St.
Lakewood, CO 80215

Environmental Health Division
Jefferson County Dept. of Health
260 South Kipling Street
Lakewood, CO 80226

Ms. Charlotte Wheeler
Pleasant View Water & Sanitation Dist.
955 Moss Street
Golden, CO 80401

West Metro Fire Protection District
447 S. Allison Parkway.
Lakewood, CO 80226-3128

Mr. Branden Baalman, Chief
Pleasant View Fire Department
955 Moss Street
Golden, CO 80401

Ms. Pamela Sheldon
City of Lakewood Planning Department
445 S. Allison Parkway
Lakewood, CO 80226

Ms. Susan Kirkpatrick, Executive Dir.
Audubon of Colorado
National Audubon Society
3109 28th Street
Boulder, CO 80301

Mr. Hal Simpson
Division of Water Resources
1313 Sherman Street, Rm 818
Denver, CO 80203

Mr. Terry Green
Jefferson County Emergency Prep.
100 Jefferson County Pkwy, Suite 4570
Golden, CO 80419

Mr. Walter S. Welton, President
Consolidated Mutual Water Company
12700 W. 27th Avenue
Lakewood, CO 80215

Mr. Bud Smead, Director
Jefferson County Public Works Div.
1700 Arapahoe Street
Golden, CO 80419

Mr. Greg Stevinson
Denver West Ltd.
1546 Cole Blvd.
Golden, CO 80401

Ms. Valerie Farnham
Denver West Ltd.
1546 Cole Blvd.
Golden, CO 80401

Joy Lucisano
Acquisitions Specialist
Jefferson County Open Space
100 Jefferson County Parkway
Golden, CO 80419-5540

Ann Kelson
Assistant County Attorney
Jefferson County Open Space
100 Jefferson County Parkway
Golden, CO 80419-5540

Jeff Isom
Pleasant View Water & Sanitation Dist.
955 Moss Street
Golden, CO 80401

Rue Eich
Metro Wastewater Reclamation Dist.
6450 York Street
Denver, CO 80229-7499

Dale Lauer
Metro Sanitation District
Board of Directors
952 Moss
Golden, CO 80401

Ms. Katie Fendel
Golden Public Works Office
City of Golden
911 10th Street
Golden, CO 80401

Mr. Ronald Beckham
Jefferson County Sheriff
17900 W. 10th Avenue
Golden, CO 80401-2679

Mr. Steve Glueck, Director
Golden Planning & Development Dept.
1445 10th Street
Golden, CO 80401

Carl Eiberger
14330 Fairview Lane
Golden, CO 80401

Mr. John Humke, Director
Agency Relations
The Nature Conservancy
2060 Broadway, Suite 230
Boulder, CO 80302

Ms. Sally Hirsh, Office Manager
National Audubon Society
4150 Darley Avenue, Suite 5
Boulder, CO 80303

Ms. Christine Shaver
Rocky Mountain Office
Environmental Defense Fund, Inc.
2334 North Broadway
Boulder, CO 80304

Ms. Carmi McLean, Executive Dir.
Colorado/Rockies Region
Clean Water Action
899 Logan Street, Suite 101
Denver, CO 80203

Jefferson County Public Schools
1829 Denver West Drive
Golden, CO 80401

Ms. Maggie Fox
Sierra Club
Southwest Office
2260 Baseline Road, Suite 105
Boulder, CO 80302

Sierra Club
Rocky Mountain Chapter
1410 Grant Street
Denver, CO 80203

Mr. Eric Blank
Land & Water Fund of the Rockies
2260 Baseline Road, Suite 200
Boulder, CO 80302

Neil Cloud
NAGPRA Coordinator
Southern Ute Tribe
P.O. Box 737
Ingacio, CO 81137

National Wildlife Federation
2260 Baseline Road
Boulder, CO 80302

Robert Wilber, District Coordinator
Pleasant View Metro District
955 Moss Street
Golden, CO 80401

Adolph Coors Company
1819 Denver West Drive
Golden, CO 80401

Corporatal Travel Center
1819 Denver West Drive
Golden, CO 80401

Learning International
1819 Denver West Drive
Golden, CO 80401

Mactec, Inc.
1819 Denver West Drive
Golden, CO 80401

Procard, Inc.
1819 Denver West Drive
Golden, CO 80401

Craig Cox
2900 Vance Street
Denver, CO 80215

Coleman Corporation
Attn: Dept. 586 (Real Estate)
P.O. Box 2931
Wichita, KS 67201

Oasis Denver West Apt Homes
1910 Denver West Drive
Golden, CO 80401

Boston Market, Inc.
14103 Denver West Parkway
Golden, CO 80401

Immanuel Christian Academy
15050 W. 48th Avenue
Golden, CO 80401

Einstein Bagel Company
14123 Denver West Parkway
Golden, CO 80401

AMS
14033 Denver West Parkway
Golden, CO 80401

Kurt Liss
Moore Commercial
8490 E. Crescent, Unit #200
Greenwood Village, CO 80111

Mr. Terry Gray
Assistant Coordinator
Rosebud Sioux Tribe
NAGPRA Consultation Group
P.O. Box 490
Rosebud, SD 57570

Wilbur between Lodges
Oglala Sioux Tribe
Pine Ridge, SD 57770

Mr. Chuck Jacobs
Pine Ridge Indian Reservation
Pine Ridge, SD 57770

Clement Frost
Tribal Leader
Southern Ute Tribe
P.O. Box 737
Ingacia, CO 81137

Mr. Alden Naranjo
Ms. Dorothy Naranjo
Ute Language & Culture Committee
Southern Ute Tribe
P.O. Box 737
Ingacio, CO 81137

Mr. Leonard C. Burch, Chairman
Ute Language & Culture Committee
Southern Ute Tribe
P.O. Box 737
Ingacio, CO 81137

Mr. Terry Knight
Spiritual Coordinator
Ute Mountain Ute Tribe
P.O. Box 53
Towaoc, CO 81334

Ms. Judy Knight-Frank, Chairperson
Ute Mountain Ute Tribal Council
General Delivery
Towaoc, CO 81334

Ronald Wopsock
Roland McCook
Northern Ute Indian Tribe
P.O. Box 190
Ft. Duchesene, UT 84026

Betsy Chapoose
Uinta and Ouray Ute Tribal
Business Council
P.O. Box 190
Ft. Duchesene, UT 84026

Table Mountain Conservation Fund
P.O. Box 16201
Golden, CO 80402-6004

Save the Mesas/Citizens Involved in
the Northwest Quadrant
P.O. Box 16551
Golden, CO 80402-6009

Jefferson County, Colorado Citizens
for Planned Growth with Open Space
c/o John Litz
11010 W. 29th Avenue
Lakewood, CO 80215-7120

Jeffco Open Space Foundation, Inc.
5855 Wadsworth Bypass
Building A, Suite 100
Arvada, CO 80003

Ms. Amy Aglar
Assistant to the Chief of Staff
Office of Senator Ben Nighthorse
Campbell
6950 E. Belleview Ave., Suite 200
Englewood, CO 80111

Environmental Defense
2334 Broadway
Boulder, CO 80304

Colorado Coop Fish & Wildlife Unit
201 Wagar Building
Dept. Fishery & Wildlife Biology, CSU
Fort Collins, CO 80523-1484

Mr. Gregory Davis
U.S. Environmental Protection Agency
Mailcode: EPR-EP
999 18th Street, Suite 500
Denver, CO 80202

Mr. Jim Green
State Historic Pres. Office
1300 Broadway
Denver, CO 80203

Edna Frost, Director
Tribal Information Services
Southern Ute Tribe
P.O. Box 737
Ingacio, CO 81137

Executive Director's Office
Colorado Dept. of Natural Resources
1313 Sherman Street, Room 718
Denver, CO 80203

Mr. Duane Bollig
Division Land Manager
Lafarge, Inc
1400 W. 64th Ave.,
P.O. Box 215001
Denver, CO 80221

Colorado Environmental Coalition, Inc
1536 Wynkoop
Denver, CO 80202

Colorado Office of Energy
Management and Conservation
225 E. 16th Ave, Suite 650
Denver, CO 80203

Ms. Rebecca Vickers
Environmental Services
CO Transportation Dept. Empire Park
4201 E. Arkansas Ave.
Denver, CO 80222

Manish Blair
Air Pollution Control Division
CDPHE
4300 Cherry Creek Dr. So.
Denver, CO 80246

Water Quality Division
CDPHE
4300 Cherry Creek Dr. So.
Denver, CO 80246

Office of the Environment
CDPHE
4300 Cherry Creek Dr. So.
Denver, CO 80246

Mr. Wes Wilson
NEPA Compliance, 8WMEA
EPA Region VII
999 18th Street
Denver, CO 80202-2466

Mr. Grady Towns
Denver Regional Office
US Fish and Wildlife Service
P.O. Box 25486
Denver, CO 80225

Ms. Kristine Pollard
Office of Senator Wayne Allard
7340 E. Caley, Suite 215
Englewood, CO 80111

Colorado Coop Fish & Wildlife Unit
Dept. Fishery and Wildlife Biology
201 Wagner Building, CSU
Fort Collins, CO 80523-1484

Mr. Randy Christiansen
United Power #5 Grouse Dam Rd.
Golden, CO 80403

Ms. Nanette Neelon
Special Projects Coordinator
Jefferson County
100 Jefferson County Pkwy
Golden, CO 80419-3500

Assessor's Office
Jefferson County
100 Jefferson County Pkwy
Golden, CO 80419

Highways and Transportation
Jefferson County
100 Jefferson County Pkwy., Ste. 3500
Golden, CO 80419-3500

Mr. Preston Gibson, AICP
Planning and Engineering Mgr.
Jefferson Co. Planning & Zoning Off.
100 Jefferson County Pkwy, Ste. 3550"
Golden, CO 80419-3550

Mr. David Field
Jefferson Co. Planning & Zoning Off.
100 Jefferson County Pkwy., Ste. 3550
Golden, CO 80419-3550

Ms. Judy Peratt
Jefferson Co. Emergency Preparedness
100 Jefferson County Pkwy
Suite 4570
Golden, CO 80419

Mr. Vince Auriemma
Golden Public Works Office
City of Golden
1445 10th Street
Golden, CO 80401

Chris Wooley
Wildfire Mitigation Specialist
Jefferson County Emergency Mgmt
1504 Quaker Street
Golden, CO 80401-2956

Mr. Bruce Colter
Golden District Office
Colorado State Forest Service
1504 Quaker Street
Golden, CO 80401-2956

Mr. Allen Gallamore
Golden District Office
Golden District Forester
1504 Quaker Street
Golden, CO 80401-2956

Mr. LeRoy Carlson
Colorado Field Supervisor
US Dept - Interior Fish & Wildlife Serv.
755 Parfet St., Rm 361
Lakewood, CO 80215

Mr. Doug Young
Office of Representative Mark Udall
1333 West 120th Ave., Suite 210
Westminster, CO 80234

Ms. Carmi McLean, Executive Dir.
Colorado/Rockies Region
Clean Water Action
899 Logan Street, Suite 101
Denver, CO 80203

Mr. Randy Frank
Jefferson County Open Space
700 Jefferson County Pkwy, Ste.100
Golden, CO 80419

Mr. Gary Finstad
Natural Resource Conservation
Service - Metro Office
U.S. Department of Agriculture
655 Parfet, Room E-300
Lakewood, CO 80215-5517

Northwest Mountain Office
Federal Aviation Administration
1601 Lind Avenue SW
Renton, WA 98055-4056

Eugene H. Backhaus
District Conservationist
U.S. Department of Agriculture
655 Parfet, Room E-300
Lakewood, CO 80215-5517

APPENDIX A

NREL'S ENVIRONMENTAL, HEALTH AND SAFETY POLICIES, PROGRAMS AND PERMITS

APPENDIX A

NREL'S ENVIRONMENTAL, HEALTH AND SAFETY POLICIES

2-1 Integrated Safety Management
6-1 Environment, Safety, and Health
6-2 Environment Management
6-3 Property Protection
6-4 Worker Safety and Health
6-5 Occupational Medicine
6-6 Risk Assessment

NREL'S ENVIRONMENTAL, HEALTH AND SAFETY PROGRAMS

Aboveground Storage Tank Management
Access to Medical Records
Air Quality Protection
Asbestos Management
Biosafety
Bloodborne Pathogen Control
Chemical Safety
Compressed Gas Safety
Concerns - ES&H
Confined Space Program
Construction ES&H
Cultural Resource Protection
Decommissioning - ES&H
Drinking Water
ES&H Lessons Learned
ES&H Office Desk Procedure, Radioactive Waste Disposal
Electrical Safety
Emergency Response Team (ERT)
Environmental Permitting and Notification
Ergonomics
Fall Protection
Fire Protection
Groundwater Protection
Hazard Identification and Control
Hearing Conservation
Hoisting & Rigging
Incident Reporting, Investigation, and Trending
Indoor Air Quality
Inspection - ES&H
Integrated Safety Management
Laser Safety
Local Exhaust Ventilation
Lockout/Tagout
Medical Management
Medical Surveillance
Modified Work
National Environmental Policy Act (NEPA) Implementation
Necessary and Sufficient ES&H Standards
Non-Ionizing Radiation
Ozone-Depleting Substances Management
Particulate Emissions Control for Construction
Personal Protective Equipment
Radiation Safety Program
Respiratory Protection
Safe Work Permit
Safety Council Charter
Spill Prevention Control Plan for Lab Operations
Spill Prevention Control & Countermeasures
Storm water Pollution Prevention, NWTC
Storm water Pollution Prevention, STM
Toxic Gas Alarm
Training - ES&H
Waste Management & Minimization
Weed Management, NWTC
Weed Management, STM Site

LIST OF NREL'S ENVIRONMENTAL PERMITS AND APPROVALS

NWTC site operations and/or implementation of the Proposed Action involve or may involve the following kinds of permits, notifications, or other approvals:

- National Environmental Policy Act (NEPA) Site-Wide environmental review and associated documents;
- Air Pollution Emission Notices (APENs) filed with the Colorado Department of Public Health and Environment (CDPHE);
- Asbestos notifications for renovation and demolition would be filed with CDPHE;
- Resource Conservation and Recovery Act hazardous waste generator identification number;
- Some aboveground tanks containing chemicals, oils, fuels, and other fluids require registration with the Colorado Department of Labor;
- Clean Water Act, Section 404 permits from the U.S. Army Corps of Engineers would be required for certain actions involving "wetlands" and other waters of the United States;
- Construction related permitting for air emissions (fugitive dust), storm water discharge, drinking water and septic systems; and
- SARA Title III Compliance: Emergency Planning and Community Right-to-Know Act (EPCRA);
- Groundwater monitoring well permits;
- Hazardous material transportation (from U.S. DOT).

APPENDIX B

SCOPING LETTER AND RESPONSE LETTERS FROM RECIPIENTS

Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

April 10, 2002

DISTRIBUTION LIST

SUBJECT: REQUEST FOR PUBLIC AND AGENCY COMMENTS ON SITE-WIDE ENVIRONMENTAL ISSUES RELATED TO THE PROPOSED OPERATION AND IMPROVEMENTS AT THE NATIONAL RENEWABLE ENERGY LABORATORY'S SOUTH TABLE MOUNTAIN SITE.

The U.S. Department of Energy (DOE), in compliance with the National Environmental Policy Act of 1969 (NEPA), will be preparing a site-wide environmental assessment (EA) of proposed operations and improvements at the National Renewable Energy Laboratory's (NREL) South Table Mountain site near Golden, Colorado. NREL is a federally owned, contractor-operated research facility that supports renewable energy and energy efficiency technologies. A detailed description of the site and the Proposed Action are included in the attachment to this letter. DOE is the lead agency for this EA, and other federal, state, and local agencies are invited to participate in the environmental documentation process. DOE is requesting public input on the proposed NEPA process, proposed actions and alternatives, and the environmental issues to be addressed in the EA.

DOE plans to distribute the draft EA for public review and comment by October 2002. This letter and the draft EA, when it is available, will be posted as it becomes available on the DOE Golden Field Office electronic reading room at www.golden.doe.gov.

Please direct your written and oral comments to:

Steve Blazek
NEPA Compliance Officer
DOE Golden Field Office
1617 Cole Boulevard
Golden, CO 80401-3393
(303) 275-4723
(303) 275- 4788 (fax)
steve_blazek@nrel.gov :

Please provide your input on or before May 15, 2002. We look forward to hearing from you.

Sincerely,

John Kersten, Acting Manager

Attachment: As Stated

PURPOSE AND NEED

A Site-Wide EA for the STM and the 3 buildings at the eastern end of the DWOP was prepared in 1993. In accordance with DOE NEPA implementing regulations (10 CFR section 1021.330), DOE is required to evaluate existing Site-Wide EAs periodically to determine whether they adequately address current agency plans, functions, programs and resource utilization. Based on current program priorities, applicable regulatory processes, and new research and development proposals, DOE has determined that a new comprehensive EA should be prepared for these sites at this time.

This Site-Wide EA will provide an opportunity to review the collective potential effects of existing and proposed facilities and operations at the STM and DWOP sites. The purpose and need for the Proposed Action is to operate the sites with new and improved capability to support DOE's mission to research and develop renewable energy and energy efficiency technologies.

PROPOSED ACTION AND ALTERNATIVES

The following presents a summary of the current Proposed Action and No Action alternative descriptions. Other alternatives raised during the scoping period will be considered and may be addressed in the EA if they are consistent with the Proposed Action purpose and need.

Proposed Action

The Proposed Action is to continue operation of the STM and DWOP sites for alternative energy research with new and improved capability. New construction would include permanent physical improvements to the sites that involve buildings and equipment, utilities and other infrastructure. The Proposed Action also consists of expanded activities not requiring new permanent facilities or infrastructure, including research programs, facility operations, management practices and maintenance activities.

The components of the Proposed Action are addressed according to two implementation periods:

Short-Term (2003-2007)
Long-Term (2008-2022)

Federal budgeting decisions and fluctuating priorities will determine which components of the proposed actions are selected for funding and implementation. Thus, the specific physical requirements and locations of proposed facilities as well as their actual construction schedules are uncertain for most short-term and long-term components. In many cases, the descriptions of the improvements will be in general terms and the locations and schedules for components will be estimated based on currently available information. If implemented, these potential scenarios could change to involve more or less development. Therefore, the EA will use a "bounding analysis" approach to consider the full range of possible development scenarios.

Short-Term Components (2003-2007)

The Short-Term improvement program includes components for both the STM site and the DWOP site, but most of the physical improvements will occur at the STM site. The following improvements define the short-term components of the Proposed Action:

ENVIRONMENTAL TOPICS TO BE ADDRESSED

The proposed EA will address primary, direct, indirect, secondary and cumulative impacts of the Proposed Action and alternatives. Beneficial and adverse, on-site and off-site, construction, demolition, and operation and maintenance impacts will be discussed, as appropriate. The environmental topics to be discussed in the EA include:

Land Use, Planning, Socioeconomics and Public Policy
Traffic and Circulation
Air Quality and Noise
Visual Quality/Aesthetics
Water Resources
Soils and Geology
Biological Resources
Cultural Resources
Waste Management
Public Facilities, Services and Utilities
Energy

SCHEDULE

The schedule for key milestones to complete the NEPA review process is:

Close of Scoping Period	May 15, 2002
Public Distribution of the Draft EA	October 2002

No formal public scoping meeting is currently planned for this project. This letter and the draft EA, when it is available, will be posted on the Golden Field Office electronic reading room at http://www.golden.doe.gov.

Please direct written and oral comments to:

Steve Blazek
NEPA Compliance Officer
DOE Golden Field Office
1617 Cole Boulevard
Golden, CO 80401-3393
(303) 275-4723
(303) 275- 4788 (fax)
steve_blazek@nrel.gov

FIGURES:

Figure 1 Regional Location Map, South Table Mountain Site
Figure 2 Local Setting Map, South Table Mountain Site
Figure 3 Site Plan, South Table Mountain Site

May 14, 2002

Steve Blazek
NEPA Compliance Officer
1617 Cole Boulevard
Golden, CO 80401-3393

Re: Proposed Operation and Improvements at the National Renewable Energy Laboratory's South Table Mountain Site.
Case Number 020150510RP1

Review of the materials provided yielded the following comments:

Current Planning:
Development in this area should be compatible with the goals and objectives outlined in the *Jefferson County General Land Use Plan* and the *Jefferson County Zoning Resolution.* We would like to have the opportunity to review the Environmental Assessment in draft format. County planning staff review proposals against the appropriate community plan, applicable zoning requirements, and county policy. This review will be much more helpful when specific sites and structures are identified. Please contact Michael Smyth at 303.271.8719 with any questions.

Engineering Geologist:
The scope listed the soils and geology that will be considered in the EA, therefore, the potential for swelling soils and slope failure complex should be addressed. Please call Pat O'Connell at 303.271.8707 with any questions on geology.

Planning Engineering:
Planning Engineering has reviewed the proposal and has no comments at this time. We would like to provide further comment with the site expansion design when available. Please call Brad Sheehan at 303.271.8488 with any planning engineering questions.

Zoning Administrator:
I have reviewed the referral for the scope of the Environmental Assessment for the NREL facility. I don't find any immediate issues with the proposed short term

and long term proposed actions, The area in question is zoned A-2 and falls within the jurisdiction of Jefferson County. Any development may be subject to a Site Approval process, and the applicable permits obtained for any projects undertaken. Please contact Michael Chadwick at 303.271.8704 with any questions.

Jefferson County Health Department:
The scope of the proposed Environmental Assessment for this property appears to be appropriate. We would expect that the air quality component would include a discussion on odors.

Mindi Ramig, REHS
Environmental Health Services Division
Department of Health and Environment
mramig@co.jefferson.co.us
303.271.5736
303.271.5760

Long Range Planning:
Current Zoning and Land Use of Surrounding Properties: The property is currently zoned A2 and is in the Camp George West area.

Community Plan Recommendations:
It appears that the Denver West Office Park sites are within the incorporated boundaries of the City of Lakewood.

The South Table Mountain Site is subject to the recommendations in *The General Land Use Plan.* It is in the Camp George West Area. Although no specific recommendations are provided for this area, combined access, buffering from adjacent residential should be considered.

Recommendations and Comments:

- This referral should be sent to the City of Lakewood for comment on the Denver West Office Park.
- Specific comments can be provided once a site plan is submitted.
- Community/public input should be obtained. A site plan showing specific improvements should be provided for the public.

Please contact Kate Newman at 303.271.8735 with any questions on Long Range comments.

Open Space:
Open Space was concerned that the contractual and use issues expressed in the Conservation Easement agreements are protected.
Please contact Mark Hearon at 303.271.8772 with any questions on open space.

I am acting as the case manager for this review. Please call me at 303.271.8719 with any questions you have regards the process or county documents.

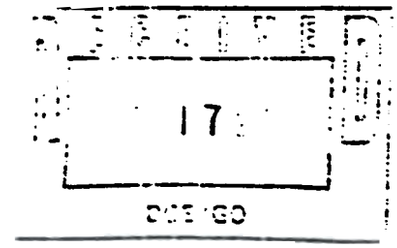
Sincerely,

Michael Smyth, AICP
Planner
Planning and Zoning Department
100 Jefferson County Parkway, Suite 3550
Golden, CO 80419

cc: Preston Gibson
Current Planning Administrator
Planning and Zoning
100 Jefferson Parkway, Suite 3550
Golden, CO 80419-3550

Nanette Neelan
Special Projects Coordinator
County Administrator's Office
100 Jefferson Parkway, Suite 3550
Golden, CO 80419-3550

Save the Mesas
c/o Don Parker, President
305 Lookout View Dr.
Golden, CO 80401
303-279-4549
stm@donparker.org



May 14, 2002

Steve Blazek
NEPA Compliance Officer
DOE Golden Field Office
1617 Cole Blvd.
Golden, CO 80401

Sent by email to - steveblazek@nrel.gov

Subject:: Save the Mesas comments on DOE Golden Field Office request for public comments on site-wide environmental issues related to the proposed operation and improvements at the National Renewable Energy Laboratory's South Table Mountain Site

Dear Mr. Blazek:

The Board of Save the Mesas met to discuss your request for public comments and we offer the following:

1. Save the Mesas, a citizens group committed to preserving North and South Table Mountains, fully supports the mission, activities, and goals of the National Renewable Energy Laboratory. We are pleased that NREL chose to locate in Golden and we support the upgrading and enhancement of facilities at the South Table Mountain Site that further the mission, activities, and goals of NREL. We support the continued 2-3% annual growth of the facilities as considered likely in the request for public comments.
2. Save the Mesas is committed to keeping all development off the top and the presently undeveloped portions of the slopes of South Table Mountain and we oppose the addition of any new developments on the Mesa Top portion of the NREL South Table Mountain Site, and we oppose any new developments that would be located any higher on the slopes than the present facilities, with the exception that we would support restoration of the amphitheater.
3. We support the removal of any and all "semi-permanent" facilities on the Mesa Top when those facilities are no longer needed.

4. We support NREL's current efforts to minimize the impact of lighting at the Mesa Top facility by use of lights triggered by motion detectors, and the use of methods to direct the light to only those areas needing light.
5. We propose that to minimize impacts, any new facilities be located to the extent possible in land no higher in elevation than the current main building on the slope of the South Table Mountain Site. To minimize the environmental impacts of new facilities, we propose NREL use the newly acquired Camp George West land and other flatter lower lands to the maximum extent possible before placing any further developments on upper slopes or on the top.
6. We propose that the Environmental Assessment (EA) particularly consider the land use and planning impacts, including cumulative impacts. Current local land use plans, visions and authorities disfavor developments on the top or upper slopes of the Table Mountains. Developments on the higher slopes and on the top are contrary to local City and County land use visions and plans. Any further developments high on the slopes and on the mesa top may set land use precedents that could lead to further developments on the higher slopes and top by other land owners. This result would be a significant adverse impact. We recommend soliciting comments from the City Of Golden and from Jefferson County on this matter.
7. We propose that the EA particularly the visual quality and aesthetics of placement of any new facilities, in that where options are available, using lands lower in elevation can be used to minimize visual quality and aesthetics impacts.
8. We propose that the EA particularly consider the benefits of locating facilities on the lower lands to minimize impacts to traffic and circulation (by both workers and visitors), air quality and noise, and biological resources, and energy use.
9. With regard to lighting we propose that the EA particularly consider the impacts of lighting on visual quality and aesthetics, and cumulative impacts on land use, planning, light pollution, biological resources and energy consumption.
10. We propose that the EA particularly consider the impacts of all its activities by the examples it sets. NREL is looked to as an expert so it has environmental impacts, both favorable and unfavorable, far beyond its own activities. Examples set by NREL can have significant indirect environmental impacts. Some examples to set would be minimizing visual impacts and maximizing aesthetics, using lighting that minimizes energy use, minimizing impacts to traffic and automobile use, promoting land use compatible with local desires and standards, recycling, minimizing adverse impacts to biological, cultural, water, and other natural resources and enhancing the environment in ways that are apparent.
11. The outdoor theater could be characterized as historically, culturally and socially significant to Golden. It is possible NREL expansion on the South Table Mesa could encroach on the theater. One way to ameliorate this

impact would be to revitalize and preserve the theater, for example by working with local historical groups.

12. One great way to minimize impacts on land use, planning, visual quality, aesthetics, biological resources, and various cumulative impacts resulting from the Mesa Top facility and any further developments would be to buy all or portions of South Table Mountain and dedicate the use to conservation. This would also protect the 180-degree access to the sun afforded by the natural mesa top to those facilities and experiments. In the scheme of things that cost might be reasonable and the positive impact would be huge.

Thank you very much for the opportunity to comment at this stage in the process of the development of your plans and your new EA. Please put us on your mailing and emailing lists.

We remember and much appreciate the previous dedication of most of NREL's Mesa Top land to conservation.

Very sincerely,

Don Parker, President
Save the Mesas

Jordan, Maureen

From: Blazek, Steve
Sent: Tuesday, May 07, 2002 8:07 AM
To: Jordan, Maureen
Subject: FW: lights on STM

Steve Blazek
NEPA Compliance Officer
U.S. DOE Golden Field Office
Golden, CO 80401

303-275-4723
303-275-4788 (FAX)

----Original Message----
From: John Lahr [mailto:johnjan@lahr.org]
Sent: Thursday, May 02, 2002 10:30 PM
To: steve_blazek@nrel.gov
Cc: Steve_Sargent@nrel.gov
Subject: lights on STM

Steve Blazek
NREL

Hi Steve,
You might want to check out http://www.darksky.org/
and this one:
http://search1.npr.org/opt/collections/torched/me/data_me/seg_140490.htm
Cheers,
John

What's with the bright lights on the top of South Table Mountain?
You are quoted as saying:
"We would entertain reasonable suggestions as to how we might further reduce the visibility of our lights to the community." [steve_blazek@nrel.gov]
Why not nave them connected to motion sensors? This would provide the same amount of security lighting but they would only be turned on when necessary. In fact this would enhance security because the police could see from a distance if the lights are on and dnve up for a quick check. This would also reduce energy consumption and it seems NREL should lead by example in this area.
Cheers,
John

John C. Lahr
1925 Foothills Road
Golden, CO 80402
Phone: (303) 215-9913
john@lahr.org
http://lahr.org/john-jan/

Jordan, Maureen

From: Blazek, Steve
Sent: Monday, May 13, 2002 7:34 AM
To: Jordan, Maureen
Subject: FW: NREL expansion

FYI - Note the water storage tank comment-

Steve Blazek
NEPA Compliance Officer
U.S. DOE Golden Field Office
Golden, CO 80401

303-275-4723
303-275-4788 (FAX)

----Original Message----
From: J White [mailto:jwh1te@yahoo.com]
Sent: Friday, May 10, 2002 7:50 AM
To: steve_blazek@nrel.gov
Subject: NREL expansion

Dear Mr. Blazek,

As a Golden resident, Colorado native and member of the GoldenCO@yahoogroups listserv, I have a few comments regarding NREL's proposed expansion on the top of South Table Mountain.
Like others, I support the alternative energy research NREL is involved in. You have been extremely cooperative about the lighting situation there and that has not gone unnoticed. I understand why you would want to put water storage at the highest point available to you.
However, I oppose any development that encroaches farther up the mesa than your primary buildings are today. (And they are quite high.) I oppose any and all development on the top of South Table Mesa proper.

You have a reasonably sized campus with plenty of extra space. You are scientists involved with alternative energy research. Please, put your teams together and come up with a more creative solution. I understand no compelling and convincing reasons for you to expand further up the mesa.
Thank you,

Jen White
17301 Rimrock Dr
Golden, CO 80401
jwh1te@yahoo.com

Jordan, Maureen

From: Mary & Don Parker [maryndon@attbi.com]
Sent: Wednesday, May 15, 2002 2:20 PM
To: goldenco; Judy Denison
Subject: [Fwd: Growth]

Growth

Dear Mr. Blazek,

As Al Bartlet - CU physics Prof point out below, 2-3% growth results in some pretty extensive increases if taken out a few decades. My comments on Save the Mesas' supporting NREL's 2-3% growth rate is only for 10-20 years at most. A 3% growth would result in a doubling of the size of NREL in about 25 years and 2% in about 35 years so that growth rate can't continue for too many decades before NREL would outgrow its current facilities and/or do a lot more development on its South Table Mountain site.

Please add growth and growth rate to the scope of the EA.

Don Parker

May 15, 2002

TO: Steve Blazek
NEPA Compliance Officer
DOE Golden Field Office
FAX # (303) 275-4788

RE: REQUEST FOR PUBLIC COMMENTS ON SITE-WIDE ENVIRONMENTAL ISSUES RELATED TO THE PROPOSED OPERATION AND IMPROVEMENT AT THE NATIONAL RENEWABLE ENERGY LABORATORY'S (NREL) SOUTH TABLE MOUNTAIN (STM) SITE.

Dear Mr. Blazek:

I support the proposed plan to continue operation of the STM and Denver West Office Park (DWOP) with new and improved capability. I have used the educational resources, including tours and workshops, at NREL several times. I plan to incorporate the knowledge I've gained into a new house I will be building in the next few years and in the business I own. My business will be purchasing a new building this year and we will use the NREL resources during the planning and tenant finish of the new commercial property.

I have found the staff to be very helpful and informative. The resource materials that are available have been useful. I strongly support increased research into renewable energy and would support any improvements made in NREL's ability to do research and educate the public.

Thank you for the opportunity to comment.

Sincerely yours,

Teresa Bath
P. O. Box 255
Golden, Colorado 80402
(303) 271-0488

Kennedy, Brian P.

From: Karl Buchholz [KarBuc@lakewood.org]
Sent: Friday, July 05, 2002 10:23 AM
To: Brian Kennedy (E-mail)
Cc: Maureen Jordan (E-mail); David Baskett; Karl Buchholz; Jerry Goldman; Karen Lind (E-mail); John Mullins (E-mail)
Subject: NREL EA

Karl Buchholz (E-mail).vcf

Brian,
Thank you for taking the time to meet with Dave Baskett and me last week. I've had a chance to review the information you provided for NREL's long-term growth scenario at South Table Mountain.

After reviewing the data you provided, I believe your traffic projections are a little too conservative (high). The Institute of Transportation Engineers publishes trip generation data for various land uses. The ITE Trip Generation Manual (6th Ed) provides trip data for Research and Development Centers based on number of employees. The ITE data estimates the number of daily trips for such a facility to be 2.77 trips per employee. For the worst case growth scenario of 1461 new employees at STM in 2022, the number of new daily trips would be 4,047. ITE also provides data for the AM and PM peak hours for outbound and inbound trips. During the AM peak hour, ITE data suggests the number of new trips would be 540 inbound and 88 outbound. For the PM peak hour, the number of new trips would be 60 inbound and the 539 outbound. Using this data, the number of new trips during the AM and PM peak hours are about one-half of what you've estimated.

Using the ITE data, I added the new NREL STM trips to the 2020 traffic volumes presented in the Mills Traffic Study for the intersections along Denver West Marriot Blvd. from Denver West Parkway to Cole Blvd. I did not do a detailed traffic analysis of the intersection capacities, but upon inspection of the new volumes, I believe the I-70 interchange ramp intersections and the Cole intersection should be able to absorb the additional traffic without significant impacts. The Denver West Parkway/Denver West Marriot Blvd. intersection will see a large increase in the volume of traffic turning left (NB to WB) during the AM peak period and, correspondingly, a large increase in right turns (EB to SB) during the PM peak period. Based on a preliminary analysis during the AM peak period it appears this intersection has the capacity to handle the added NREL traffic during the 2022 scenario. During the PM peak period, however, the intersection will likely be over-capacity due to the high volume of EB right-turns from DWP to DWMB. Under the PM 2022 scenario, a double right-turn lane will probably be needed to mitigate the increase in right turning traffic (estimated at approximately 440 additional right-turns during the PM peak hour). As a result, the City of Lakewood would like to see this impact addressed as part of the EA process.

I hope this information is helpful for evaluating the environmental impacts of this EA. Please keep us informed as the EA process moves forward and let me know if you have any questions regarding the above.

Sincerely,
Karl Buchholz, PE
Principal Traffic Engineer
City of Lakewood

<<Karl Buchholz (E-mail vcf>>

LANTZ ASSOCIATES
13335 W. 72nd Cir.
Arvada, CO 80005
(303) 887-3714
(303) 423-4949 fax

July 12, 2002

Brian Kennedy
SAIC
405 Urban Street, Suite 400
Lakewood, CO 80228

RE: Scoping for NREL Environmental Assessment

Dear Mr. Kennedy:

Thank you for the opportunity to provide input for the scoping process for the EA you are preparing for NREL. We have reviewed the information concerning the EA process and I am sending the following comments on behalf of Denver West.

- We agree with the trip generation estimates that Karl Buchholz at the City of Lakewood provided to you (4,047 daily, 628 AM Peak, 599 PM Peak).

- Even though Karl stated that he thought the roadway system can accommodate the additional traffic, we would like to see a Traffic Impact Study prepared. That study will provide detailed analysis of the various turning movements at the intersections along Denver West Marriott Boulevard. The study will also identify any turn lanes that might be too short or will be over capacity due to the additional traffic.

- The Traffic Impact Study should look at the intersections along Denver West Marriott Boulevard from Denver West Parkway to Colfax Boulevard.

- The Traffic Impact Study could either be done on a conceptual basis with the EA, and then refined as specific developments are proposed, or it could be delayed until the specific developments are known. There are advantages and disadvantages to both approaches. A Traffic Impact Study completed with the EA will identify potential problem areas now, which would then be addressed in more detail in the future as specific developments are proposed. A Traffic Impact Study prepared in the future is more accurate as more details are known about the development, however, potential problems are not identified until that time.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
Colorado Field Office
755 Parfet Street, Suite 361
Lakewood, Colorado 80215

IN REPLY REFER TO:
ES/CO: Species List
Mail Stop 65412

APR 1 9 2002

John Kersten
Department of Energy
1617 Cole Boulevard
Golden, Colorado 80401

RE: Proposed operation and improvements at the national renewable energy laboratory's south table mountain site near Golden, Colorado

Dear Mr. Kersten

The U.S. Fish and Wildlife Service (Service) received your letter dated April 10, 2002, regarding the proposed operation and improvements at the national renewable energy laboratory's south table mountain site near Golden, Colorado

For your convenience, we have enclosed a list of Colorado's threatened and endangered species, as well as the counties in which they are known to occur. We cannot provide site-specific details.

If questions regarding the presence of an endangered species, the extent of its habitat, or the effects of a particular action need to be resolved, the Service recommends that a knowledgeable consultant be contacted to conduct habitat assessments, trapping studies, or to provide recommendations regarding options under the Endangered Species Act. Due to staffing constraints, the Colorado Field Office cannot provide you with these services.

If you have any further questions, please call my office at (303) 275-2370.

Sincerely,

LeRoy W. Carlson
Colorado Field Supervisor

Enclosure: Species List

U. S. Fish and Wildlife Service
Ecological Services
Colorado Field Office

(Effective August 21, 2001)

FEDERALLY LISTED AND CANDIDATE SPECIES & THEIR STATUS IN COLORADO

COUNTIES→	ADAMS	ALAMOSA	ARAPAHOE	ARCHULETA	BACA	BENT	BOULDER	CHAFFEE	CHEYENNE	CLEAR CREEK	CONEJOS	COSTILLA	CROWLEY	CUSTER	DELTA
Bald eagle, *Haliaeetus leucocephalus*, Listed Threatened	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Eskimo curlew, *Numenius borealis*, Listed Endangered	✓				✓		✓							✓	
Gunnison sage-grouse, *Centrocercus minimus*, Candidate for Listing		✓		✓				✓			✓	✓			✓
Least tern (interior population), *Sterna antillarum*, Listed Endangered					✓	✓									
Lesser prairie chicken, *Tympanuchus pallidicinctus*, Candidate for Listing					✓	✓			✓				✓		
Mexican spotted owl, *Strix occidentalis lucida*, Listed Threatened	✓	✓	✓	✓			✓	✓		✓	✓	✓		✓	
Mountain plover, *Charadrius montanus*, Proposed Threatened	✓	✓	✓		✓	✓	✓		✓				✓		
Piping plover, *Charadrius melodus*, Listed Threatened					✓	✓									
Southwestern willow flycatcher, *Empidonax trailli extimus*, Listed Endangered		✓		✓							✓	✓			✓
Whooping crane, *Grus americana*, Listed Endangered	✓	✓		✓	✓		✓							✓	
Yellow-billed cuckoo, *Coccyzus americanus*, Candidate for Listing		✓		✓							✓	✓			✓
Black-footed ferret, *Mustela nigripes*, Listed Endangered	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓	✓		✓
Black-tailed prairie dog, *Cynomys ludovicianus*, Candidate for Listing	✓		✓		✓	✓	✓		✓				✓		
Canada lynx, *Lynx canadensis*, Listed Threatened		✓		✓			✓	✓		✓	✓	✓		✓	✓
Preble's meadow jumping mouse, *Zapus hudsonius preblei*, Listed Threatened	✓		✓				✓								
Boreal toad, *Bufo boreas boreas*, Candidate for Listing				✓			✓	✓		✓	✓				✓

U. S. Fish and Wildlife Service
Ecological Services
Colorado Field Office

(Effective August 21, 2001)

FEDERALLY LISTED AND CANDIDATE SPECIES & THEIR STATUS IN COLORADO
1

COUNTIES→	ADAMS	ALAMOSA	ARAPAHOE	ARCHULETA	BACA	BENT	BOULDER	CHAFFEE	CHEYENNE	CLEAR CREEK	CONEJOS	COSTILLA	CROWLEY	CUSTER	DELTA	I E N V I
Arkansas darter, *Etheostoma cragini*, Candidate for Listing					✓	✓			✓				✓			
Bonytail, *Gila elegans*, (presumed-historical) Listed Endangered															✓	
Colorado pikeminnow, *Ptychocheilus lucius*, Listed Endangered				*											⊙	
Greenback cutthroat trout, *Oncorhynchus clarki stomias*, Listed Threatened							✓			✓				✓		
Humpback Chub, *Gila cypha*, Listed Endangered															✓	
Pallid sturgeon, *Scaphirhynchus albus*, Listed Threatened	*		*				*			*						
Razorback sucker, *Xyrauchen texanus*, Listed Endangered				*											⊙	
Clay-loving wild buckwheat, *Eriogonum pelinophilum*, Listed Endangered															✓	
Colorado butterfly plant, *Gaura neomexicana* ssp. *coloradensis*, Listed Threatened	✓		✓				✓									
Uinta Basin hookless cactus, *Sclerocactus glaucus*, Listed Threatened															✓	
Uncompahgre fritillary butterfly, *Boloria acrocnema*, Listed Endangered								✓								
Ute ladies'-tresses, *Spiranthes diluvialis*, Listed Threatened	✓		✓				✓									

U. S. Fish and Wildlife Service
Ecological Services
Colorado Field Office

(Effective August 21, 2001)

FEDERALLY LISTED AND CANDIDATE SPECIES & THEIR STATUS IN COLORADO

COUNTIES →	DOLORES	DOUGLAS	EAGLE	ELBERT	EL PASO	FREMONT	GARFIELD	GILPIN	GRAND	GUNNISON	HINSDALE	HUERFANO	JACKSON	JEFFERSON	KIOWA	KIT CARSON
Bald eagle, *Haliaeetus leucocephalus*, Listed Threatened	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
Eskimo curlew, *Numenius borealis*, Listed Endangered				✓			✓							✓	✓	✓
Gunnison sage-grouse, *Centrocercus minimus*, Candidate for Listing	✓		✓				✓			✓						
Least tern (interior population), *Sterna antillarum*, Listed Endangered															✓	
Lesser prairie chicken, *Tympanuchus pallidicinctus*, Candidate for List															✓	
Mexican spotted owl, *Strix occidentalis lucida*, Listed Threatened	✓	✓			✓	✓	✓	✓				✓		✓		
Mountain plover, *Charadrius montanus*, Proposed Threatened		✓		✓	✓							✓	✓		✓	✓
Piping plover, *Charadrius melodus*, Listed Threatened															✓	✓
Southwestern willow flycatcher, *Empidonax trailli extimus*, Listed Endangered	✓						✓			✓						
Whooping crane, *Grus americana*, Listed Endangered				✓								✓				
Yellow-billed cuckoo, *Coccyzus americanus*, Candidate for Listing	✓		✓				✓		✓	✓	✓					
Black-footed ferret, *Mustela nigripes*, Listed Endangered	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓		✓		✓	✓
Black-tailed prairie dog, *Cynomys ludovicianus*, Candidate for Listing		✓		✓	✓	✓						✓		✓	✓	✓
Canada lynx, *Lynx canadensis*, Threatened	✓		✓			✓	✓	✓	✓	✓	✓	✓	✓	✓		
Preble's meadow jumping mouse, *Zapus hudsonius preblei*, Listed Threatened		✓		✓	✓									✓		
Arkansas darter, *Etheostoma cragini*, Candidate for Listing				✓	✓	✓						✓			✓	
Bonytail, *Gila elegans*, (presumed-historical) Listed Endangered	*		*				✓		*	*	*					
Colorado pikeminnow, *Ptychocheilus lucius*, Listed Endangered	*		*				○		*	*	*					
Greenback cutthroat trout, *Oncorhynchus clarki stomias*, Listed Threatened		✓			✓							✓				

Humpback Chub, *Gila cypha*, Listed Endangered	*		*				✓		*	*	*					

COUNTIES→

U. S. Fish and Wildlife Service
Ecological Services
Colorado Field Office

(Effective August 21, 2001)

FEDERALLY LISTED AND CANDIDATE SPECIES & THEIR STATUS IN COLORADO

	DOLORES	DOUGLAS	EAGLE	ELBERT	EL PASO	FREMONT	GARFIELD	GILPIN	GRAND	GUNNISON	HINSDALE	HUERFANO	JACKSON	JEFFERSON	KIOWA	K
Pallid sturgeon, *Scaphirhynchus albus*, Listed Threatened		*											*	*		
Razorback sucker, *Xyrauchen texanus*, Listed Endangered	*		*				●		*	*	*					
Pawnee montane skipper, *Hesperia leonardus montana*, Listed Threatened		✓												✓		
Uncompahgre fritillary butterfly, *Boloria acrocnema*, Listed Endangered	✓		✓							✓	✓					
Boreal toad, *Bufo boreas boreas*, Candidate for Listing	✓		✓				✓	✓	✓	✓	✓		✓			
Colorado butterfly plant, *Gaura neomexicana* ssp. *coloradensis*, Listed Threatened		✓			✓									✓		
De Beque phacelia, *Phacelia submutica*, Candidate for Listing							✓									
North Park phacelia, *Phacelia formosula*, Listed Endangered													✓			
Osterhout milkvetch, *Astragalus osterhoutii*, Listed Endangered									✓							
Parachute beardtongue, *Penstemon debilis*, Candidate for Listing							✓									
Penland beardtongue, *Penstemon penlandii*, Listed Endangered									✓							
Slender moonwort, *Botrychium lineare*, Candidate for Listing					✓											
Uinta Basin hookless cactus, *Sclerocactus glaucus*, Listed Threatened							✓									
Ute ladies'-tresses, *Spiranthes diluvialis*, Listed Threatened		✓			✓									✓		

U. S. Fish and Wildlife Service
Ecological Services
Colorado Field Office

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FEDERALLY LISTED AND CANDIDATE SPECIES & THEIR STATUS IN COLORADO

	COUNTIES →	LAKE	LA PLATA	LARIMER	LAS ANIMAS	LINCOLN	LOGAN	MESA	MINERAL	MOFFAT	MONTEZUMA	MONTROSE	MORGAN	OTERO	OURAY	PARK
Bald eagle, *Haliaeetus leucocephalus*, isted Threatened		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Eskimo curlew, *Numenius borealis*, Listed Endangered			✓	✓	✓		✓						✓			
Gunnison sage-grouse, *Centrocercus minimus*, Candidate for Listing			✓					✓			✓	✓			✓	
Least tern (interior population), *Sterna antillarum*, Listed Endangered				✓									✓			
Lesser prairie chicken, *Tympanuchus pallidicinctus*, Candidate for Listing					✓											
Mexican spotted owl, *Strix occidentalis lucida*, Listed Threatened			✓	✓	✓					✓	✓	✓				✓
Mountain plover, *Charadrius montanus*, Proposed Threatened			✓	✓	✓	✓				✓			✓	✓		✓
Piping plover, *Charadrius melodus*, Listed Threatened				✓									✓			
Southwestern willow flycatcher, *Empidonax traillii extimus*, Listed Endangered			✓					✓			✓	✓			✓	
Yellow-billed cuckoo, *Coccyzus americanus*, Candidate for Listing			✓					✓	✓	✓	✓	✓			✓	
Whooping crane, *Grus americana*, Listed Endangered				✓	✓		✓	✓		✓	✓		✓			
Black-footed ferret, *Mustela nigripes*, Listed Endangered			✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
Black-tailed prairie dog, *Cynomys ludovicianus*, Candidate for Listing			✓	✓	✓	✓							✓	✓		
Canada lynx, *Lynx canadensis*, Listed Threatened	✓	✓	✓	✓			✓	✓	✓	✓	✓				✓	✓
Preble's meadow jumping mouse, *Zapus hudsonius preblei*, Listed Threatened			✓										✓			
Arkansas darter, *Etheostoma cragini*, Candidate for Listing				✓	✓									✓		
Bonytail, *Gila elegans*, (presumed-historical) Listed Endangered							●		●		*				*	
Colorado pikeminnow, *Ptychocheilus lucius*, Listed Endangered		*					●	*	●	*	*				*	
Greenback cutthroat trout, *Oncorhynchus clarki stomias*, Listed Threatened	✓		✓													✓

Humpback chub, *Gila cypha*, Listed Endangered							●		●		*			*	

COUNTIES →

U. S. Fish and Wildlife Service
Ecological Services
Colorado Field Office

(Effective August 21, 2001)

FEDERALLY LISTED AND CANDIDATE SPECIES & THEIR STATUS IN COLORADO

	LAKE	LA PLATA	LARIMER	LAS ANIMAS	LINCOLN	LOGAN	MESA	MINERAL	MOFFAT	MONTEZUMA	MONTROSE	MORGAN	OTERO	OURAY	PARK
Pallid sturgeon, *Scaphirhynchus albus*, Listed Threatened			*			*						*			*
Razorback sucker, *Xyrauchen texanus*, Listed Endangered		*					●	*	●	*	*			*	
Boreal toad, *Bufo boreas boreas*, Candidate for Listing	✓	✓	✓				✓	✓	✓	✓				✓	✓
Pawnee montane skipper, *Hesperia leonardus montana*, Listed Threatened															✓
Uncompahgre fritillary butterfly, *Boloria acrocnema*, Listed Endangered	✓	✓						✓						✓	✓
Clay-loving wild buckwheat, *Eriogonum pelinophilum*, Listed Endangered											✓				
Colorado butterfly plant, *Gaura neomexicana* ssp. *coloradensis*, Listed Threatened			✓												
De Beque phacelia, *Phacelia submutica*, Candidate for Listing							✓								
Knowlton's cactus, *Pediocactus knowltonii*, Listed Endangered		✓													
Mancos milkvetch, *Astragalus humillimus*, Listed Endangered										✓					
Mesa Verde cactus, *Sclerocactus mesae-verdae*, Listed Threatened										✓					
Penland alpine fen mustard, *Eutrema penlandii*, Listed Threatened	✓														✓
Sleeping Ute milk-vetch, *Astragalus tortipes*, Candidate for Listing										✓					
Slender moonwort, *Botrychium lineare*, Candidate for Listing	✓														
Uinta Basin hookless cactus, *Sclerocactus glaucus*, Listed Threatened							✓				✓				
Ute ladies'-tresses, *Spiranthes diluvialis*, Listed Threatened			✓									✓			

U. S. Fish and Wildlife Service
Ecological Services
Colorado Field Office

FEDERALLY LISTED AND CANDIDATE SPECIES & THEIR STATUS IN COLORADO

	COUNTIES →	PITKIN	PROWERS	PUEBLO	RIO BLANCO	RIO GRANDE	ROUTT	SAGUACHE	SAN JUAN	SAN MIGUEL	SEDGWICK	SUMMIT	TELLER	WASHINGTON	WELD
Bald eagle, *Haliaeetus leucocephalus*, Listed Threatened		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Eskimo curlew, *Numenius borealis*, Listed Endangered			✓			✓					✓			✓	✓
Gunnison sage-grouse, *Centrocercus minimus*, Candidate for Listing		✓				✓		✓		✓					
Least tern (interior population), *Sterna antillarum*, Listed Endangered			✓								✓			✓	✓
Lesser prairie chicken, *Tympanuchus pallidicinctus*, Candidate for Listing			✓												
Mexican spotted owl, *Strix occidentalis lucida*, Listed Threatened		✓		✓		✓		✓		✓		✓	✓		✓
Mountain plover, *Charadrius montanus*, Proposed Threatened			✓	✓	✓	✓		✓						✓	✓
Piping plover, *Charadrius melodus*, Listed Threatened			✓								✓			✓	✓
Southwestern willow flycatcher, *Empidonax trailli extimus*, Listed Endangered						✓		✓		✓					
Whooping crane, *Grus americana*, Listed Endangered			✓	✓				✓			✓			✓	✓
Yellow-billed cuckoo, *Coccyzus americanus*, Candidate for Listing		✓			✓	✓	✓	✓	✓	✓		✓			
Black-footed ferret, *Mustela nigripes*, Listed Endangered			✓	✓	✓	✓	✓	✓		✓				✓	✓
Black-tailed prairie dog, *Cynomys ludovicianus*, Candidate for Listing			✓	✓							✓		✓	✓	✓
Canada lynx, *Lynx canadensis*, Listed Threatened		✓		✓	✓	✓	✓	✓	✓	✓		✓			
Preble's meadow jumping mouse, *Zapus hudsonius preblei*, Listed Threatened				✓											✓
Pawnee montane skipper, *Hesperia leonardus montana*, Listed Threatened													✓		
Uncompahgre fritillary butterfly, *Boloria acrocnema*, Listed Endangered		✓			✓		✓	✓	✓			✓			
Arkansas darter, *Etheostoma cragini*, Candidate for Listing			✓	✓											
Bonytail, *Gila elegans*, (presumed-historical) Listed Endangered		*			*		*	*		*		*			

COUNTIES →

U. S. Fish and Wildlife Service
Ecological Services
Colorado Field Office

(Effective August 21, 2001)

FEDERALLY LISTED AND CANDIDATE SPECIES & THEIR STATUS IN COLORADO

	PITKIN	PROWERS	PUEBLO	RIO BLANCO	RIO GRANDE	ROUTT	SAGUACHE	SAN JUAN	SAN MIGUEL	SEDGWICK	SUMMIT	TELLER	WASHINGTON	WELD	YUMA
Colorado pikeminnow, *Ptychocheilus lucius*, Listed Endangered	*			©	*	*	*	*	*		*				
Greenback cutthroat trout, *Oncorhynchus clarki stomias*, Listed Threatened			✓												
Humpback Chub, *Gila cypha*, Listed Endangered	*			*		*	*		*		*				
Pallid sturgeon, *Scaphirhynchus albus*, Listed Threatened										*				*	
Razorback sucker, *Xyrauchen texanus*, Listed Endangered	*			*	*	*	*	*	*		*				
Boreal toad, *Bufo boreas boreas*, Candidate for Listing	✓			✓	✓	✓	✓	✓	✓		✓				
Colorado butterfly plant, *Gaura neomexicana* spp. *coloradensis*, Listed Threatened			✓											✓	
Dudley Bluffs (Piceance) twinpod, *Physaria obcordata*, Listed Threatened				✓											
Dudley Bluffs bladderpod, *Lesquerella congesta*, Listed Threatened				✓											
Graham beardtongue, *Penstemon grahamii*, Candidate for Listing				✓											
Penland alpine fen mustard, *Eutrema penlandii*, Listed Threatened											✓				
Ute ladies'-tresses, *Spiranthes diluvialis*, Listed Threatened														✓	
White River beardtongue (penstemon), *Penstemon scariosus* var. *albifluvis*, Candidate for Listing				✓											

TABLE TERMINOLOGY

✓	The check mark indicates that the species is present in that county or that the county is within the historical range of the species
	Water depletions in these counties may affect these species
✓	This sign means that the species is present in the county and there is designated critical habitat for the species within the county
Candidate	Means there is sufficient information indicating that formal listing under the ESA may be appropriate
Proposed	Means the species is proposed for possible addition to the Lists of Endangered and Threatened Wildlife and Plants under the ESA
Endangered	Means the species could become extinct
Threatened	Means the species could become endangered

APPENDIX C

CONSULTATION AND COORDINATION WITH THE STATE HISTORIC PRESERVATION OFFICER

Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

October 10, 2002

Ms. Georgiana Contiguglia
State Historic Preservation Officer
Colorado Historical Society
1300 Broadway
Denver, CO 80203

Dear Ms. Contiguglia:

SUBJECT: U.S. DEPARTMENT OF ENERGY SITE-WIDE ENVIRONMENTAL ASSESSMENT OF THE NATIONAL RENEWABLE ENERGY LABORATORY'S SOUTH TABLE MOUNTAIN COMPLEX, DOE/EA-1440

This letter constitutes a request for concurrence on the determination of affect by the proposed improvements and maintenance activities at the Department of Energy's (DOE's) South Table Mountain (STM) site and the Denver West Office Park (DWOP).

The STM and DWOP sites are located in Jefferson County, Colorado (Figure 1), and can be found on the Morrison, Colorado and Golden Colorado USGS 7.5 minute maps. The STM site is within Township 3 South, Range 70 West, Section 36 and Township 4 South, Range 70 West, Section 1. The DWOP site is within Township 3 South, Range 69 West, Section 31 and Township 4 South, Range 69 West, Section 6.

In compliance with the National Environmental Policy Act (NEPA), a site-wide Environmental Assessment (EA) is in progress for these two locations to ensure the consideration of environmental aspects in site planning activities. The STM site includes a variety of facilities that provide a combined total of 191,787 square feet of space for laboratories, administration, and research support activities and house more than 50 percent of NREL's workers. The DWOP consists of leased office space within buildings No. 15, 16, 17 and 27, and is located east and south of the STM site. The site–wide EA addresses activities at both locations that may occur during future years of operation, including construction, relocating employees and modifying offices and laboratories. Because any changes to the DWOP facilities only involve modifications to leased office space within existing multi-story office buildings, DOE has determined that no historic properties would be affected and no cultural resources survey is necessary for this location. Therefore, this request for concurrence pertains only to the STM site.

The EA's Proposed Action includes new and enhanced capabilities at the STM site to support DOE's mission to research and develop renewable energy technologies. Improvements would include the construction of buildings and equipment, utilities, and other infrastructure. The Proposed Action also includes typical operation and maintenance activities. All improvements would be dependent on the availability of funding.

Four cultural resources surveys have been conducted on the STM facility. Through these surveys, the entire NREL STM property has been surveyed to 100 percent Class III standards. These surveys were conducted by:

- Front Range Research Associates. 1992. Historic Resources Survey Camp George West, Golden, Colorado.
- Butler. 1992. Archaeological Survey of Camp George West and the Works Progress Administration South Table Mountain Basalt Quarries, Jefferson County, Colorado.
- Forum Associates. 1988. Historical Review, Solar Energy Research Institute, Golden, Colorado.
- Nelson. 1980. Historic and Prehistoric Resources, South Table Mountain, Golden, Colorado.

These surveys resulted in the nomination of one historic district (Camp George West) with two contributing features located within the STM site, and two individually eligible historic structures located outside the district, but within the STM site (Table 1). Twenty-five acres of the northernmost part of Camp George West Historic District was recently transferred to DOE ownership. See Figure 2 for location of 25-acre parcel.

Table 1: Resources Identified on the STM Site

Site #	Description	NRHP Status	Historic District
5JF842	Amphitheater & Footbridge	Listed	N/A
5JF843	Ammunition Igloo (1940)	Listed	N/A
5JF145.66	Firing Range Lines (1924)	Contributing	Camp George West
5JF145.68	Low Rock Walls	Contributing	Camp George West

Amphitheater & Footbridge (5JF842): DOE has identified the amphitheater and low stone bridge as a protected site. No disturbance will occur as a result of the Proposed Action. DOE has determined that no historic properties would be affected.

Ammunition Igloo (5FJ843): DOE has identified the ammunition igloo as a protected structure. No disturbance will occur as a result of the Proposed Action. DOE has determined that no historic properties would be affected.

Camp George West Historic District: A 25-acre parcel of the Camp George West Historic district was recently transferred to the DOE ownership for inclusion in the STM site. This 25-acre parcel is located within an area identified for facility and infrastructure improvements. DOE anticipates developing the entire 25 acres. Two contributing features occur within the 25-acre parcel. These are two concrete firing lines (5JF145.66) and portions of low rock walls.

(5JF145.68). Photos are attached for your review. In addition, this area has the potential for buried deposits. DOE has determined that the Proposed Action would adversely affect these historic properties.

Table 2: Determinations of Effect

Site #	Description	NRHP Status	Determination
5JF842	Amphitheater & Footbridge	Listed	No historic properties affected
5JF843	Ammunition Igloo	Listed	No historic properties affected
5JF145.66 & 68	Camp George West Historic District Firing Range Lines & Low Rock Walls	Historic District	Historic properties are adversely affected

I hereby request your concurrence on the determination of affect for the Proposed Action in the site-wide EA for the STM in Jefferson County, Colorado. Your response is necessary for DOE's compliance with Section 106 of the National Historic Preservation Act (as amended) and with the Advisory Council on Historic Preservation regulations.

DOE understands that potential mitigation measures for the Camp George West Historic District could include activities such as:

- Landscaping,
- Systematic testing for buried historical archaeological deposits, and
- Continual coordination with your office.

We look forward to further consultation to develop mitigation for this project. If you require additional information, please contact **Laura Ziemke (consultant)** at 720-981-2475.

Sincerely,

Steve Blazek
NEPA Compliance Officer

Enclosures: As Stated

Cc: Laura Ziemke, SAIC

Science Applications International Corporation
An Employee-Owned Company

February 26, 2003

Joe Saldibar
Colorado Historical Society
Office of Archaeology and Historic Preservation
1300 Broadway
Denver, CO 80203

RE: Camp George West Historic District
U.S. Department of Energy Site-wide Environmental Assessment of the National Renewable Energy Laboratory's South Table Mountain Complex, DOE/EA-1440.

Dear Joe:

As we discussed yesterday, I'm sending you a copy of the letter submitted to Ms. Contiguglia by the Department of Energy (DOE) on October 10, 2002. The letter is a request for concurrence on the determination of effect by the proposed improvements and maintenance activities at the DOE's South Table Mountain site and the Denver West Office Park. I will give you a call early next week to discuss the project.

Thank you for your assistance.

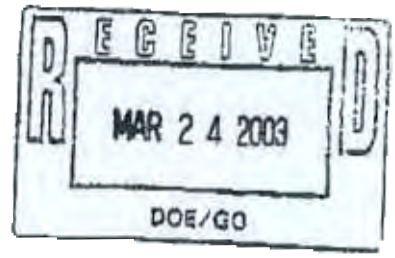
Sincerely,

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

Laura Ziemke
Cultural Resource Specialist
720-981-2475

cc: Maureen Jordan, NREL
Brian Kennedy, SAIC

COLORADO
HISTORICAL
SOCIETY



The Colorado History Museum 1300 Broadway Denver, Colorado 80203-2137

14 March 2003

Roselle Drahushak-Crow
NEPA Document Manager
DOE Golden Field Office
1617 Cole Blvd.
Golden, CO 80401-3393

RE: National Renewable Energy Laboratory, South Table Mountain Complex, Golden, Jefferson County

Dear Ms. Drahushak-Crow:

Thank you for your recent correspondence dated 5 March 2003, concerning the proposed new construction at the National Renewable Energy Laboratory in Golden. Your letter states that a Draft Environmental Assessment (DOE/EA 1440) is now available for review. Please send us a copy of this document for our files. When we have received the document, we will conduct our review and provide comments, if necessary.

If you have any questions, please feel free to contact Joseph Saldibar, Architectural Services Coordinator, at (303) 866-3741. We look forward to hearing from you.

Sincerely,

for Georgianna Contiguglia
State Historic Preservation Officer, and
President, Colorado Historical Society

OFFICE OF ARCHAEOLOGY AND HISTORIC PRESERVATION
303-866-3392 * Fax 303-866-2711 * E-mail: oahp@chs.state.co.us * Internet: www.coloradohistory-oahp.org

COLORADO
HISTORICAL
SOCIETY

The Colorado History Museum 1300 Broadway Denver, Colorado 80203-2137

23 April 2003

Roselle Drahushak-Crow
Document Manager
Department of Energy
Golden Field Office
1617 Cole Blvd.
Golden, Co 80401-3393

RE: Draft Environmental Assessment, NREL South Table Mountain Complex, Jefferson County

Dear Ms. Drahushak-Crow:

Thank you for your recent correspondence dated 31 March 2003, concerning the proposed additions to the existing National Renewable Energy Laboratory complex at South Table Mountain. Our office has reviewed the submitted materials. Our files indicate that there are no significant archaeological or historical resources within the Area of Potential Effect (APE). There are several historic features located near the project area, but they do not fall into the APE as they will not be physically or visually affected by the project.

However, the archaeologists at OAHP have indicated that there a number of unsurveyed archaeological sites in this area. The sites have not been recorded and might be overlooked during the course of construction. We believe that a full cultural resources survey of the project area should be conducted by a professional archaeologist, and the results be incorporated into the Final Environmental Assessment. This would allow NREL to better plan potential additions to avoid archaeological sites, and would likely reduce construction delays caused by accidental discoveries.

If you have any questions, please feel free to contact Joseph Saldibar, Architectural Services Coordinator, at (303) 866-3741. We look forward to hearing from you.

Sincerely,

mark wolfe

for Georgianna Contiguglia
State Historic Preservation Officer, and
President, Colorado Historical Society

Post-it® Fax Note 7671	Date 5/6/03	# of pages ▶ 1
To Brian Kennedy	From Maureen Jordan	
Co./Dept. SAIC	Co. NREL ES&H	
Phone #	Phone # 303-275-3248	
Fax # 303-969-0200	Fax #	

COLORADO
HISTORICAL
SOCIETY

The Colorado History Museum 1300 Broadway Denver, Colorado 80203-2137

2 May 2003

Steve Blazek
NEPA Compliance Officer
Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3933

RE: National Renewable Energy South Table Mountain Complex and Denver West Office Park, Camp George West (5JF.145), Jefferson County

Dear Mr. Blazek:

Thank you for your recent correspondence dated 26 February 2003, concerning the proposed development of a portion of Camp George West to accommodate additions to the National Renewable Energy Laboratory's South Table Mountain complex. The project will also allow for improvements and modifications to existing buildings at the Denver West Office Park (DWOP), a leased office facility. We apologize for the delay in our response. Our office has reviewed the submitted materials, as well as a Draft Environmental Assessment prepared by the Department of Energy (dated March 2003) that was submitted as part of a related project.

We concur with your assessment that there are four historic properties located within the Area of Potential Effect (APE). The four sites include:

5JF.842, Amphitheater and Footbridge
5JF.843, Ammunition Igloo
5JF.145.66, Firing Range Lines, Camp George West
5JF.145.68, Low Rock Walls, Camp George West

The proposed development of this site will not adversely affect the Amphitheater, footbridge, or igloo. However, the Firing Range Lines and Low Rock Walls will be adversely affected by this project. The development of this area will result in the destruction of both resources. Therefore, please refer to the draft Memorandum of Agreement (MOA) enclosed with this letter. An electronic copy will be e-mailed to your office.

This Memorandum of Agreement should be filled out by your office and signed by the appropriate official signatory. The MOA should then be returned to our office for signature. We believe that the MOA should include the following mitigation measures:

1) Level II HABS/HAER documentation of 5JF.145.66 and 5JF.145.68: These two historic resources will be demolished. As a result, they should be photographed according to HABS/HAER Level II Documentation Standards (Black and white photos, printed on archival photo paper, sketch drawings of the resources, location maps, history, etc.) Please refer to the enclosed paper on the various forms of HABS/HAER documentation (OAHP #1595). Also please note that while OAHP #1595 refers to 120-mm ("medium format") photography as the standard for Level II Documentation, our office will also accept 35-mm photography.

2) A plan, or a promise to create a plan, to survey archaeological resources within the project area. Such a survey could take place all at once, and be included in the planned Final Environmental Assessment, or it could be parceled out over a period of time as building projects (and funding) come up.

3) If the archaeological survey is not planned for the planned Final Environmental Assessment, then the MOA should include language describing how the SHPO will be contacted and consulted with when future projects associated with the property come up.

4) If a full archaeological survey is not included in the planned Final Environmental Assessment, the SHPO must be consulted each time a building is to be constructed in the project area. Each proposed building site will require a "mini-survey" to determine whether there are archaeological resources at that particular site.

If you have any questions, please feel free to contact Joseph Saldibar, Architectural Services Coordinator, at (303) 866-3741. We look forward to hearing from you.

Sincerely,

Mark Wolfe

for Georgianna Contiguglia
State Historic Preservation Officer, and
President, Colorado Historical Society

Enclosed: *Draft Memorandum of Agreement (MOA)*
Addendum A: Archival Documentation
OAHP #1595: Historic Resource Documentation Standards

CC: Laura Ziemke, Cultural Resource Specialist, SAIC

STATUS OF CONSULTATION AND COORDINATION WITH THE STATE HISTORIC PRESERVATION OFFICER

Consultation with the SHOP to develop final mitigation measures is ongoing. Consistent with Federal law (National Historic Preservation Act, Section 106 and 36 CFR 800.5 and 800.6, DOE and the State Historic Preservation Officer shall negotiate an Memorandum of Agreement (MOA) regarding requirements for identified cultural resources in Zone 6.

Overview of 25-acre parcel to be developed by DOE – Facing Northwest
Existing South Table Mountain structures are in the background.
This parcel is included in the Camp George West Historic District boundaries.

Overview of 25-acre parcel to be developed by DOE – Facing West
Northern segment of Camp George West Historic District

Tumbled Rock Walls

Firing Line – Facing West

Firing Line – Facing East

APPENDIX D

LETTERS OF NOTICE OF AVAILABILITY OF DRAFT SITE-WIDE EA

Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393
March 5, 2003

Dear Stakeholder:

SUBJECT: NOTICE OF AVAILABILITY OF DRAFT SITE-WIDE ENVIRONMENTAL ASSESSMENT OF NATIONAL RENEWABLE ENERGY LABORATORY'S SOUTH TABLE MOUNTAIN COMPLEX (DOE/EA 1440)

The Draft Site-Wide Environmental Assessment (DOE/EA 1440) of the National Renewable Energy Laboratory's (NREL) South Table Mountain Complex (STM) is available for public review. You can access this document online at www.golden.doe.gov. A copy of the document can be obtained by contacting Roselle Drahushak-Crow at the address and telephone number listed below. The U.S. Department of Energy (DOE) Golden Field Office (GO) has prepared this document in accordance with the National Environmental Policy Act (NEPA) and DOE's NEPA implementation guidance. DOE issued a Notice of Scoping dated April 10, 2002, requesting comments from federal, state, and local agencies, interested organizations, and individuals. Comments received in response to that request have been incorporated into the draft EA.

Proposed Action

NREL is dedicated to the research and development of renewable energy and energy efficiency technologies. The 327-acre STM complex is located on the southeast side of South Table Mountain in unincorporated Jefferson County, near Golden, Colorado. There are currently six laboratories, a few small test facilities and several support buildings, and offices and laboratories located in the Denver West Office Park (DWOP) on the east side of Interstate 70.

The Proposed Action is to continue operation of the STM and DWOP sites for alternative energy research with new and improved capability. New construction would include permanent physical improvements to the sites that involve buildings and equipment, utilities and other infrastructure. The Proposed Action also consists of expanded activities not requiring new permanent facilities or infrastructure, including research programs, facility operations, management practices and maintenance activities.

Request for Comments

Consistent with NEPA implementing guidelines, it is DOE's policy to integrate community and public concerns into its decision-making processes. Comments on this draft EA will be accepted for a period of 30 days. Please submit comments by Friday, April 11, 2003, to:

Roselle Drahushak-Crow
NEPA Document Manager
DOE Golden Field Office
1617 Cole Boulevard
Golden, CO 80401-3393
(303) 275-4775 (303) 275- 4754 (fax) roselle.drahushak-crow@go.doe.gov

DOE will review and address all comments prior to issuing a final EA and subsequent finding. Thank you for your interest and participation in this process.

Sincerely,

John H. Kersten
Manager

Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

March 5, 2003

Dear Stakeholder:

SUBJECT: TRANSMITTAL OF DRAFT SITE-WIDE ENVIRONMENTAL ASSESSMENT OF NATIONAL RENEWABLE ENERGY LABORATORY'S SOUTH TABLE MOUNTAIN COMPLEX (DOE/EA 1440)

The Draft Site-Wide Environmental Assessment (DOE/EA 1440) of the National Renewable Energy Laboratory's (NREL) South Table Mountain Complex (STM) is provided on the enclosed compact disk for your review and comment. This document is also available online at http://www.golden.doe.gov, and you can obtain a printed copy by contacting Roselle Drahushak-Crow using the information listed below. The U.S. Department of Energy (DOE) Golden Field Office (GO) has prepared this document in accordance with the National Environmental Policy Act (NEPA) and DOE's NEPA implementation guidance. DOE issued a Notice of Scoping dated April 10, 2002, requesting comments from federal, state, and local agencies, interested organizations, and individuals. Comments received in response to that request have been incorporated into the draft EA.

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Consistent with NEPA implementing guidelines, it is DOE's policy to integrate community and public concerns into its decision-making processes. Comments on this draft EA will be accepted for a period of 30 days. Please submit comments by Friday, April 11, 2003, to:

Roselle Drahushak-Crow
NEPA Document Manager
DOE Golden Field Office
1617 Cole Boulevard
Golden, CO 80401-3393
(303) 275-4775 (303) 275- 4754 (fax) roselle.drahushak-crow@go.doe.gov

DOE will review and address all comments prior to issuing a final EA and subsequent finding. Thank you for your interest and participation in this process.

Sincerely,

John H. Kersten
Manager

Mr. LeRoy W. Carlson
US Fish and Wildlife Service
Colorado Field Office
P.O. Box 25486
Denver, CO 80225-0207

Bureau of Land Management
Environmental Compliance Office
2850 Youngfield Street
Lakewood, CO 80215

Mr. Terry McKee
Dept. of Army, Corps of Engineers
Omaha District
9307 State Highway 121
Littleton, CO 80123

Ms. Grace Fink
Office of Representative
Dan Schaefer
3615 S. Huron Street, Suite 101
Englewood, CO 80110

Senator Ed Perlemutter
370 17th Street
28th Floor
Denver, CO 80202-5626

Ms. Linda Coulter
Colorado Department of Agriculture
700 Kipling Street, Suite 4000
Lakewood, CO 80215

Mr. Lew Ladwig
Colorado Geological Survey
1313 Sherman Street, Rm 715
Denver, CO 80203

Mr. Gerald Craig
State Raptor Biologist
Colorado Division of Wildlife
317 Prospect Road
Fort Collins, CO 80526

Mr. Glen Anderson
Colorado Association of Soil
Conservation Districts
3000 Youngfield, Suite 163
Lakewood, CO 80215

Ms. Karen Hellner
Jefferson Co. Planning & Zoning Off.
700 Jefferson County Pkwy, Suite 3550
Golden, CO 80419-3550

Mr. Timothy Carey
Dept. of Army, Corps of Engineers
Omaha Dist./Tri-Lakes Project Office
9307 State Highway 121
Littleton, CO 80123

Ms. Carol Campbell
Dir. Ecosystem Protection
US EPA – Region VIII
999 18th Street, Suite 500
Denver, CO 80202-2405

Colorado State Board of Land Comm.
1313 Sherman Street, Rm 620
Denver, CO 80203

Colorado Department of Public Health
& Environment
Haz. Materials & Waste Mgmt Div.
4300 Cherry Creek Drive, South
Denver, CO 80246-1530

Mr. Perry Olson
Colorado Division of Wildlife
6060 Broadway
Denver, CO 80216

Mr. Curt Eckhart
Region 6 Office
Colorado Department of Transportation
2000 South Holly Street
Denver, CO 80222

Colorado Single Point of Contact
Division of Local Government
1313 Sherman Street, Rm 521
Denver, CO 80203

Mr. Bob Storterant
Colorado State Forest Service
203 Forestry Bldg., CSU
Fort Collins, CO 80523

Colorado Wildlife Federation
P.O. Box 280967
Lakewood, CO 80228

Ms. Doris DePenning
Friends of the Foothills
9285 Blue Mountain Dr.
Golden, CO 80403

Ms. Nancy Hollinger
Friends of the Foothills
9184 Fern Way
Golden, CO 80402

Mr. David Abelson
Rocky Flats Coalition of Local
Government
8461 Turnpike Dir
Westminster, CO 80031

Ecological Science Dept.
Soil Conservation Service
655 Parfet Street, Rm E20C
Lakewood, CO 80215

Ms. Belinda Boiko
Yenter Companies
20300 W. Highway 72
Arvada, CO 80007

Governor Bill Owens
State of Colorado
136 State Capitol
Denver, CO 80203

Mr. & Mrs. Charles Barrick
11127 Plainview Rd.
Golden, CO 80403

Teresa Bath
500 Corp. Circle #A
Golden, CO 80401

Ms. Maggie Hudson
513 Mt. Evans Rd.
Golden, CO 80401

Mr. Daniel Hayes
5115 Easly Rd.
Golden, CO 80403

Neal Lynch
500 Corp. Circle #A
Golden, CO 80401

Ms. Charlotte Wheeler
Pleasant View Water & Sanitation Dist.
955 Moss Street
Golden, CO 80401

Ms. Pamela Sheldon
City of Lakewood Planning Department
445 S. Allison Parkway
Lakewood, CO 80226

Mr. Terry Green
Jefferson County Emergency Prep.
100 Jefferson County Pkwy, Suite 4570
Golden, CO 80419

Mr. Greg Stevinson
Denver West Ltd.
1546 Cole Blvd.
Golden, CO 80401

Ann Kelson
Assistant County Attorney
Jefferson County Open Space
100 Jefferson County Parkway
Golden, CO 80419-5540

Dale Lauer
Metro Sanitation District
Board of Directors
952 Moss
Golden, CO 80401

Mr. Steve Glueck, Director
Golden Planning & Development Dept.
1445 10th Street
Golden, CO 80401

Ms. Sally Hirsh, Office Manager
National Audubon Society
4150 Darley Avenue, Suite 5
Boulder, CO 80303

Jefferson County Public Schools
1829 Denver West Drive
Golden, CO 80401

Mr. Eric Blank
Land & Water Fund of the Rockies
2260 Baseline Road, Suite 200
Boulder, CO 80302

Mr. George Goldback, Fire Chief
West Metro Fire Protection District
777 S. Wadsworth Blvd.
Building 4, Suite 220
Lakewood, CO 80226-4331

Ms. Susan Kirkpatrick, Executive
Dir. Audubon of Colorado
National Audubon Society
3109 28th Street
Boulder, CO 80301

Mr. Walter S. Welton, President
Consolidated Mutual Water Company
12700 W. 27th Avenue
Lakewood, CO 80215

Ms. Valerie Farnham
Denver West Ltd.
1546 Cole Blvd.
Golden, CO 80401

Jeff Isom
Pleasant View Water & Sanitation
Dist.
955 Moss Street
Golden, CO 80401

Ms. Katie Fendel
Golden Public Works Office
City of Golden
911 10th Street
Golden, CO 80401

Carl Eiberger
1775 Sherman, #2900
Denver, CO 90203

Ms. Christine Shaver
Rocky Mountain Office
Environmental Defense Fund, Inc.
1405 Arapahoe Ave.
Boulder, CO 80302

Ms. Maggie Fox
Sierra Club
Southwest Office
2260 Baseline Road, Suite 105
Boulder, CO 80302

Colorado Environmental Coalition,
Inc.
777 Grant Street
Denver, CO 80203

Mr. Branden Baalman, Chief
Pleasant View Fire Department
955 Moss Street
Golden, CO 80401

Mr. Hal Simpson
Division of Water Resources
1313 Sherman Street, Rm 818
Denver, CO 80203

Mr. Bud Smead, Director
Jefferson County Public Works Div.
1700 Arapahoe Street
Golden, CO 80419

Joy Lucisano
Acquisitions Specialist
Jefferson County Open Space
100 Jefferson County Parkway
Golden, CO 80419-5540

Rue Eich
Metro Wastewater Reclamation Dist.
6450 York Street
Denver, CO 80229-7499

Mr. Ronald Beckham
Jefferson County Sheriff
17900 W. 10th Avenue
Golden, CO 80401-2679

Mr. John Humke, Director
Agency Relations
The Nature Conservancy
2060 Broadway, Suite 230
Boulder, CO 80302

Ms. Carmi McLean, Executive Dir.
Colorado/Rockies Region
Clean Water Action
899 Logan Street, Suite 101
Denver, CO 80203

Sierra Club
Rocky Mountain Chapter
777 Grant Street, Suite 606
Denver, CO 80203

Colorado Wildlife Federation
7475 Dakin Street
Denver, CO 80221

National Wildlife Federation
2260 Baseline Road
Boulder, CO 80302

Learning International
1819 Denver West Drive
Golden, CO 80401

Craig Cox
2900 Vance Street
Denver, CO 80215

Boston Market, Inc.
14103 Denver West Parkway
Golden, CO 80401

AMS
14033 Denver West Parkway
Golden, CO 80401

Wilbur between Lodges
Oglala Sioux Tribe
Pine Ridge, SD 57770

Mr. Alden Naranjo
Ms. Dorothy Naranjo
Ute Language & Culture Committee
Southern Ute Tribe
P.O. Box 737
Ingacio, CO 81137

Ms. Judy Knight-Frank, Chairperson
Ute Mountain Ute Tribal Council
General Delivery
Towaoc, CO 81334

Table Mountain Conservation Fund
P.O. Box 16201
Golden, CO 80402-6004

Jeffco Open Space Foundation, Inc.
5855 Wadsworth Bypass
Building A, Suite 100
Arvada, CO 80003

Adolph Coors Company
1819 Denver West Drive
Golden, CO 80401

Mactec, Inc.
1819 Denver West Drive
Golden, CO 80401

Coleman Corporation
Attn: Dept. 586 (Real Estate)
P.O. Box 2931
Wichita, KS 67201

Immanuel Christian Academy
14481 Denver West Circle
Golden, CO 80401

Kurt Liss
Moore Commercial
8490 E. Crescent
Unit #200
Greenwood Village, CO 80111

Mr. Chuck Jacobs
Pine Ridge Indian Reservation
Pine Ridge, SD 57770

Mr. Leonard C. Burch, Chairman
Ute Language & Culture Committee
Southern Ute Tribe
P.O. Box 737
Ingacio, CO 81137

Ronald Wopsock
Roland McCook
Northern Ute Indian Tribe
P.O. Box 190
Ft. Duchesene, UT 84026

Save the Mesas/Citizens Involved in
the Northwest Quadrant
P.O. Box 16551
Golden, CO 80402-6009

The Nature Conservancy
Colorado Field Office
1244 Pine
Boulder, CO 80202

Corporatal Travel Center
1819 Denver West Drive
Golden, CO 80401

Procard, Inc.
1819 Denver West Drive
Golden, CO 80401

Oasis Denver West Apt Homes
1910 Denver West Drive
Golden, CO 80401

Einstein Bagel Company
14123 Denver West Parkway
Golden, CO 80401

Mr. Terry Gray
Assistant Coordinator
Rosebud Sioux Tribe
NAGPRA Consultation Group
P.O. Box 490
Rosebud, SD 57570

Clement Frost
Tribal Leader
Southern Ute Tribe
P.O. Box 737
Ingacia, CO 81137

Mr. Terry Knight
Spiritual Coordinator
Ute Mountain Ute Tribe
P.O. Box 53
Towaoc, CO 81334

Betsy Chapoose
Uinta and Ouray Ute Tribal
Business Council
P.O. Box 190
Ft. Duchesene, UT 84026

Jefferson County, Colorado Citizens
for Planned Growth with Open Space
c/o John Litz
11010 W. 29th Avenue
Lakewood, CO 80215-7120

Environmental Defense
2334 Broadway
Boulder, CO 80304

Robert Wilber, District Coordinator
Pleasant View Metro District
955 Moss Street
Golden, CO 80401

Edna Frost, Director
Tribal Information Services
Southern Ute Tribe
P.O. Box 737
Ingacio, CO 81137

Neil Cloud
NAGPRA Coordinator
Southern Ute Tribe
P.O. Box 737
Ingacio, CO 81137

Ms. Amy Aglar
Assistant to the Chief of Staff
Office of Senator Ben Nighthorse Campbell
6950 E. Belleview Ave., Suite 200
Englewood, CO 80111

Colorado Coop Fish & Wildlife Unit
201 Wagar Building
Dept. Fishery & Wildlife Biology, CSU
Fort Collins, CO 80523-1484

Gary L. Moreland
1490 Golden Hills Rd.
Golden, CO 80401

Shelley N. Dimick
1491 Golden Hills Rd.
Golden, CO80401

Nancy L. Moss
16600 Golden Hills Rd.
Golden, CO 80401

Gertrude M. Broszat
16630 Golden Hills Rd.
Golden, CO 80401

William L. Aki III
16675 Golden Hills Rd.
Golden, CO 80401

Donna M. Litt
16740 Golden Hills Rd.
Golden, CO 80401

Betty R. Thomas
16820 Golden Hills Rd.
Golden, CO 80401

Stanley W. Baus
645 Isabell St.
Golden, CO 80401

Richard L. Steiner
648 Isabell St.
Golden, CO 80401

Elsie P. McHattie
655 Isabell St.
Golden, CO 80401

Tina M. Kelley
660 Isabell St.
Golden, CO 80401

Sonie J. Heathman
690 Isabell St.
Golden, CO 80401

Ruth L. Hill
695 Isabell St.
Golden, CO 80401

Diane Ahonen
715 Isabell St.
Golden, CO 80401

Aileen L. Ward
735 Isabell St.
Golden, CO 80401

Dorothy W. Kelly
745 Isabell St.
Golden, CO 80401

Carl W. Spires
760 Isabell St.
Golden, CO 80401

John W. Ertel
762 Isabell St.
Golden, CO 80401

Rita M. Bucholz
765 Isabell St.
Golden, CO 80401

David E. Williams
770 Isabell St.
Golden, CO 80401

Norbert M. Janssen
775 Isabell St.
Golden, CO 80401

Clarence N. McCoy
1195 Isabell St.
Golden, CO 80401

David C. Todd
1220 Isabell St.
Golden, CO 80401

Stephen J. Walker
1345 Isabell St.
Golden, CO 80401

Colette M. Peters
1423 Isabell St.
Golden, CO 80401

Kenneth D. Malmgren
1465 Isabell St.
Golden, CO 80401

Gail M. Kafara
645 Joyce St
Golden, CO 80401

Jill J. Allen
660 Joyce St.
Golden, CO 80401

James D. Price
635 Joyce St.
Golden, CO 80401

Joyce A. York
640 Joyce St.
Golden, CO 80401

Velma J. Howarter
670 Joyce St.
Golden, CO 80401

Velma M. Sawyer
680 Joyce St.
Golden, CO 80401

Christina M. Taylor
685 Joyce St.
Golden, CO 80401

William J Stokely
700 Joyce St.
Golden, CO 80401

Curtis G. Williams
705 Joyce St.
Golden, CO 80401

Roberta J. Brown
707 Joyce St.
Golden, CO 80401

Nichole Adams
709 Joyce St.
Golden, CO 80401

Monica D. Schwenke
722 Joyce St.
Golden, CO 80401

Connie S. Beumer
740 Joyce St.
Golden, CO 80401

Brenda G. Rupp
745 Joyce St.
Golden, CO 80401

Jerry J. Duke
755 Joyce St.
Golden, CO 80401

Tiffany L. Curtis
756 Joyce St.
Golden, CO 80401

Jacqueline M. Duke
757 Joyce St.
Golden, CO 80401

Teresa M. Bailey
760 Joyce St.
Golden, CO 80401

Valerie D. Rife
765 Joyce St.
Golden, CO 80401

Ronald D. Hooper
1325 Joyce St.
Golden, CO 80401

Ethel Oestereick
1450 Joyce St.
Golden, CO 80401

Sanelivi A. Tauiliile, Jr
1460 Joyce St.
Golden, CO 80401

Sheila L. Ray
1490 Joyce St.
Golden, CO 80401

Stephanie K. Quaintance
618 Juniper St.
Golden, CO 80401

Robert J. Clark
620 Juniper St.
Golden, CO 80401

Edward A. Anton
625 Juniper St.
Golden, CO 80401

Dayleen K. Townsdin
660 Juniper St.
Golden, CO 80401

Carolyn A. King
665 Juniper St.
Golden, CO 80401

Ian V. White
670 Juniper St.
Golden, CO 80401

David L. Bell
675 Juniper St.
Golden, CO 80401

Leroy A. Wilson
680 Juniper St.
Golden, CO 80401

Richard M. Radman
708 Juniper St.
Golden, CO 80401

Dawn E. Blakely
720 Juniper St.
Golden, CO 80401

Nathan R. Kleewein
735 Juniper St.
Golden, CO 80401

Troy D. Babb
741 Juniper St.
Golden, CO 80401

Harold L. & Jean R. Ballard
745 Juniper St.
Golden, CO 80401

Beverly A. Kapke
752 Juniper St.
Golden, CO 80401

Emily C. Biltoft
755 Juniper St.
Golden, CO 80401

Richard J. Mattson
761 Juniper St.
Golden, CO 80401

Michael J. Webster
761 Juniper St.
Golden, CO 80401

Joseph N. Scott
765 Juniper St.
Golden, CO 80401

Susan M. Brown
780 Juniper St.
Golden, CO 80401

Paul D. Fanning, Jr.
790 Juniper St.
Golden, CO 80401

Patrick A. Fiedler
1305 Juniper St.
Golden, CO 80401

Allen V. Rutherford
1340 Juniper St.
Golden, CO 80401

Gilbert R. Dickman
1345 Juniper St.
Golden, CO 80401

Cheryl K. Ray
1355 Juniper St.
Golden, CO 80401

Le Roy F. Lamgo
1395 Juniper St.
Golden, CO 80401

Rebecca L. Johnson
1465 Juniper St.
Golden, CO 80401

Louella M. Ray
1467 Juniper St.
Golden, CO 80401

Sherri A. Wisdom Dickman
1470 Juniper St.
Golden, CO 80401

Randy A. Eilders
1480 Juniper St.
Golden, CO 80401

Martin J. Rodriguez
625 Juniper St. #2
Golden, CO 80401

Roger D. Standridge
625 Juniper St. #3
Golden, CO 80401

Teresa L. Prescott
615 Kendrick St.
Golden, CO 80401

Hiram J. Bright
620 Kendrick St.
Golden, CO 80401

Wauneta J. Jones
625 Kendrick St.
Golden, CO 80401

Ardis J. Graham
635 Kendrick St.
Golden, CO 80401

Mildred I. Burtlow
655 Kendrick St.
Golden, CO 80401

Joseph C. Dondelinger
656 Kendrick St.
Golden, CO 80401

Virginia L. Dondelinger
658 Kendrick St.
Golden, CO 80401

Jennifer L. Foster
678 Kendrick St.
Golden, CO 80401

Paul S. Fischer
685 Kendrick St.
Golden, CO 80401

Jason L. Springfield
698 Kendrick St.
Golden, CO 80401

Robert L. Mooney, Jr.
705 Kendrick St.
Golden, CO 80401

Lisa A. Sosa
720 Kendrick St.
Golden, CO 80401

Kinberly K. Greulich
730 Kendrick St.
Golden, CO 80401

Gerald D. Arnold
735 Kendrick St.
Golden, CO 80401

Edward P. Roy
740 Kendrick St.
Golden, CO 80401

James F. Prell
750 Kendrick St.
Golden, CO 80401

Katherine L. Morgan
780 Kendrick St.
Golden, CO 80401

Angela S. Johnston
799 Kendrick St.
Golden, CO 80401

Shelley J. Garcia
990 Kendrick St.
Golden, CO 80401

Jacquelyn Decoster
1300 Kendrick St.
Golden, CO 80401

Harold E. Ray
1440 Kendrick St.
Golden, CO 80401

Dorothy H. Turner
1460 Kendrick St.
Golden, CO 80401

Gregory S. Wing
1475 Kendrick St.
Golden, CO 80401

Mark D Freeland
626 Moss St.
Golden, CO 80401

Ralph G. Beatty
869 Moss St.
Golden, CO 80401

Kenneth C. Lewis, II
905 Moss St.
Golden, CO 80401

Jay C. Gibbons
925 Moss St.
Golden, CO 80401

Richard H. Mortimer
970 Moss St.
Golden, CO 80401

Bret D. Snyder
970 Moss St.
Golden, CO 80401

Rebecca L. Bell
985 Moss St.
Golden, CO 80401

Charlene L. Kirby
990 Moss St.
Golden, CO 80401

Michael R. Makofske
1002 Moss St.
Golden, CO 80401

Jimmy L. Pridmore
1005 Moss St.
Golden, CO 80401

Arthur F. Myers
1010 Moss St.
Golden, CO 80401

Bryce C. Christensen
1325 Moss St.
Golden, CO 80401

Clint L. Reffel
1355 Moss St.
Golden, CO 80401

Jeffrey L. Powers
1375 Moss St.
Golden, CO 80401

Paul S. Glenn
1395 Moss St.
Golden, CO 80401

John V. Miles
805 Nile Ct.
Golden, CO 80401

Carole D. Crow
815 Nile Ct.
Golden, CO 80401

Patricia C. McCall
825 Nile Ct.
Golden, CO 80401

Tiffany D. Riggs
827 Nile Ct.
Golden, CO 80401

Andrew J. Hebein
845 Nile Ct.
Golden, CO 80401

Steven G. Carnefix
855 Nile Ct.
Golden, CO 80401

Della M. Johnson
895 Nile Ct.
Golden, CO 80401

Jennifer L. Steinert
897 Nile Ct.
Golden, CO 80401

Michael G. Zurkan
897 Nile Ct.
Golden, CO 80401

Major L. Coleman
695 Nile St.
Golden, CO 80401

John L. Bennett
705 Nile St.
Golden, CO 80401

Jennifer D. Stevens
920 Nile St.
Golden, CO 80401

Michelle C. Hollingsworth
930 Nile St.
Golden, CO 80401

Jeffrey P. Deitchel
940 Nile St.
Golden, CO 80401

Rayna L. Thomas
960 Nile St.
Golden, CO 80401

Steven M. Ziemann
980 Nile St.
Golden, CO 80401

Carol A. Selbe
1002 Nile St.
Golden, CO 80401

Lois A. Bolter
1005 Nile St.
Golden, CO 80401

Jeffrey A. Gleason
1015 Nile St.
Golden, CO 80401

Timothy J. Klecker
1225 Nile St.
Golden, CO 80401

Ellen G. McFadden
1290 Nile St.
Golden, CO 80401

Jack M. Miller
1310 Nile St.
Golden, CO 80401

Margurite E. Beaman
1350 Nile St.
Golden, CO 80401

Frank R. Yeatts
1395 Nile St.
Golden, CO 80401

David M. Calwil
1425 Nile St
Golden, CO 80401

Loretta A. Arterburn
1490 Nile St.
Golden, CO 80401

Stephen A. Berwanger
775 Nobel St.
Golden, CO 80401

Michael F. Hollingsworth
805 Noble Ct.
Golden, CO 80401

Paula D. Battelli
807 Noble Ct.
Golden, CO 80401

Eric J. Lyonnais
809 Noble Ct.
Golden, CO 80401

Camilla C. Coon
811 Noble Ct.
Golden, CO 80401

Donna J. Noble
825 Noble Ct.
Golden, CO 80401

Edith Joan Durant
830 Noble Ct.
Golden, CO 80401

Richard M. Broom
835 Noble Ct.
Golden, CO 80401

Bertha M. Heistuman
840 Noble Ct.
Golden, CO 80401

Gary W. Friskey
850 Noble Ct.
Golden, CO 80401

Courtney S. Sample
855 Noble Ct.
Golden, CO 80401

Rita L. Healy
875 Noble Ct.
Golden, CO 80401

Lisa M. Williams
765 Noble St.
Golden, CO 80401

Ruth E. & John S Clute
1062 Noble St.
Golden, CO 80401

Maria I. Pena
1072 Noble St.
Golden, CO 80401

Aaron M. Peters
1072 Noble St.
Golden, CO 80401

Richard L. Hastings
1125 Noble St.
Golden, CO 80401

Harmon H. Heckart
1130 Noble St.
Golden, CO 80401

Helen L. Price
1240 Orchard Rd.
Golden, CO 80401

Daryl N. Hanson
675 Orchard St.
Golden, CO 80401

Christopher C. Holton
920 Orchard St.
Golden, CO 80401

Heather B. Dill
940 Orchard St.
Golden, CO 80401

Brett E. Pohl
945 Orchard St.
Golden, CO 80401

Dino Lee
950 Orchard St
Golden, CO 80401

Patrick T. Dunn
960 Orchard St.
Golden, CO 80401

Brian E. Glackin
970 Orchard St.
Golden, CO 80401

Norma J. Ray
975 Orchard St.
Golden, CO 80401

Janet A. Ray
975 ½ Orchard St.
Golden, CO 80401

David W. Frazier
980 Orchard St.
Golden, CO 80401

Chad M. Calkins
990 Orchard St.
Golden, CO 80401

Timothy J. Pilger
1015 Orchard St.
Golden, CO 80401

Roger E. Edwards
1020 Orchard St.
Golden, CO 80401

Jay M. Witaschek
1035 Orchard St.
Golden, CO 80401

Michael T. Caldwell
1130 Orchard St.
Golden, CO 80401

Beth E. Perez
1150 Orchard St.
Golden, CO 80401

Tanya L. Mentgen
1185 Orchard St.
Golden, CO 80401

Lewis D. Norlund
1225 Orchard St.
Golden, CO 80401

Sharon A. Rosema
1275 Orchard St.
Golden, CO 80401

June E. Sanford
1325 Orchard St.
Golden, CO 80401

Gregory E. Birney
1345 Orchard St.
Golden, CO 80401

Dorothea C. Nelson
1350 Orchard St.
Golden, CO 80401

Christopher Vigil
1425 Orchard St.
Golden, CO 80401

Michelle A. Fraser
1435 Orchard St.
Golden, CO 80401

Erik M. Vonhalle
1490 Orchard St.
Golden, CO 80401

Gary J. Jeski
1495 Orchard St.
Golden, CO 80401

Alan T. Archer
990 Orchard St.
Golden, CO 80401

Jodi L. Robertson
805 Orion St.
Golden, CO 80401

Suzanne K. Doyle
825 Orion St.
Golden, CO 80401

Karen C. Ljungvall
830 Orion St.
Golden, CO 80401

Dwain L. Gleason
835 Orion St.
Golden, CO 80401

Debra A. Cullison
840 Orion St.
Golden, CO 80401

Alex J. Schrinsky
845 Orion St.
Golden, CO 80401

George A. Potter
860 Orion St.
Golden, CO 80401

John T. Defeo
861 Orion St.
Golden, CO 80401

John H. Baldwin
870 Orion St.
Golden, CO 80401

Anna M. Moffett
885 Orion St.
Golden, CO 80401

Craig A. Benson
890 Orion St.
Golden, CO 80401

Beverly S. Tompkins
895 Orion St.
Golden, CO 80401

Marilyn L. Hamlin
931 Orion St.
Golden, CO 80401

Robert L. Defler
940 Orion St.
Golden, CO 80401

Donald E. Clark
950 Orion St.
Golden, CO 80401

Jean M. Atkinson
970 Orion St.
Golden, CO 80401

Jacob Bieber
1120 Orion St.
Golden, CO 80401

Connie E. Matson
1125 Orion St.
Golden, CO 80401

James J. Ackerman
1135 Orion St.
Golden, CO 80401

Barbara A. Shaffer
1150 Orion St.
Golden, CO 80401

Nelda B. Ware
1155 Orion St.
Golden, CO 80401

Annabelle R. Garrett
1160 Orion St.
Golden, CO 80401

Sherilan D. Arterburn
1170 Orion St.
Golden, CO 80401

Elinor M. Pearce
1180 Orion St.
Golden, CO 80401

Joy S. Pickthall
1185 Orion St.
Golden, CO 80401

Sharon R. Kettler
1190 Orion St.
Golden, CO 80401

Patricia L. Pickthall
1195 Orion St.
Golden, Co 80401

Roxanna J. Conner
P.O. Box 1062
Golden, CO 80401

Barbara J. Eaton
P.O. Box 1203
Golden, Co 80401

Melvin R. Alejandro
P.O. Box 1263
Golden, CO 80401 -1263

Antonio J. Adams
P.O. Box 13735
Golden, CO 80401

Carol M. Jarnutowski
P.O. Box 1546
Golden, CO 80401

Leland L. Durbin
P.O. Box 324
Golden, CO 80401

Leita K. Koch
P.O. Box 333
Golden, CO 80401

Bernadine Morton
P.O. Box 5273
Golden, CO 80401

Larry E. Mossberger
P.O. Box 5295
Golden, CO 80401

Ethyl E. Oestereick
P.O. Box 55
Golden, CO 80401

Harry A. Robertson
P.O. Box 56
Golden, CO 80401

William E. Herrington
P.O. Box 727
Golden, CO 80401

Sheree L. Downs
P.O. Box 805
Golden, CO 80401

Luana K. Mauer Frantz
1450 Pike St
Golden, CO 80401

Lynn G. Armentrout
1145 Pike St.
Golden, CO 80401

William M. Logan
1145 Pike St.
Golden, CO 80401

Debra Reynolds
1160 Pike St.
Golden, CO 80401

Margaret A. Dryden
1170 Pike St.
Golden, CO 80401

P. M. Franke
1180 Pike St.
Golden, CO 80401

Theresa L. Lewis
1185 Pike St.
Golden, CO 80401

Michael S. Anderson
1205 Pike St.
Golden, CO 80401

Wanda E. Wages
1240 Pike St.
Golden, CO 80401

Frank M. McCulla
1270 Pike St.
Golden, CO 80401

Amber L. Kennedy
1289 Pike St.
Golden, CO 80401

Tony L. Deleon
1291 Pike St.
Golden, CO 80401

Christi L. Schaller
1309 Pike St.
Golden, CO 80401

Lynda V. Davis
1311 Pike St.
Golden, CO 80401

Leota I. Lucke
1346 Pike St.
Golden, CO 80401

Eldon M. Earley
1347 Pike St.
Golden, CO 80401

Mildred L. Earley
1349 Pike St.
Golden, CO 80401

Mary Jo Westhead Vigil
1369 Pike St.
Golden, CO 80401

Dorine M. Warling
1376 Pike St.
Golden, CO 80401

Ann M. Phillips
1389 Pike St.
Golden, CO 80401

Paul T. Deger
1398 Pike St.
Golden, CO 80401

Leonora J. Whiteaker
1408 Pike St.
Golden, CO 80401

Frank R. Seibert
1419 Pike St.
Golden, CO 80401

Kurt J. Butler
1439 Pike St.
Golden, CO 80401

Florence E. Peschiera
1419 Pike St.
Golden, CO 80401

Elizabeth L. Glenn
905 Quaker St.
Golden, CO 80401

Delano Blair
915 Quaker St.
Golden, CO 80401

Mary A. Warren
930 Quaker St.
Golden, CO 80401

Robert D. Brownlee
990 Quaker St.
Golden, CO 80401

Andrew C. Mott
1033 Quaker St.
Golden, CO 80401

Lula B. Malcom
1053 Quaker St.
Golden, CO 80401

Lee E. Eddy
1063 Quaker St.
Golden, CO 80401

Robert A. Fulcomer
1083 Quaker St.
Golden, CO 80401

David K. Dumas
1103 Quaker St.
Golden, CO 80401

Patrick A. Thompson
1212 Quaker St.
Golden, CO 80401

James R. Jarnutowski
1222 Quaker St.
Golden, CO 80401

Derek J. Wolf
1232 Quaker St.
Golden, CO 80401

Carlos A. Hernandez
1252 Quaker St.
Golden, CO 80401

Shelley Denison
1262 Quaker St.
Golden, CO 80401

Linda J. Kennedy
1305 Quaker St.
Golden, CO 80401

Mitzi A. Illy
1315 Quaker St.
Golden, CO 80401

Anthony J. Moss
1344 Quaker St.
Golden, CO 80401

Juanita E. Moss
1346 Quaker St.
Golden, CO 80401

Bryan L. Macheel
1353 Quaker St.
Golden, CO 80401

Nadine O. Sorahan
1354 Quaker St.
Golden, CO 80401

Katherine S. Rader Weak
1356 Quaker St.
Golden, CO 80401

Charles W. Ellis
1377 Quaker St.
Golden, CO 80401

Lucinda J. Croissant
1380 Quaker St.
Golden, CO 80401

Gary K. Pearson
1390 Quaker St.
Golden, CO 80401

Joseph L. Linton
1400 Quaker St.
Golden, CO 80401

Betsy B. Linton
1402 Quaker St.
Golden, CO 80401

Harriet C. Andrews
1403 Quaker St.
Golden, CO 80401

Jason G. Ayres
1450 Quaker St.
Golden, CO 80401

Milton W. Presler
1452 Quaker St.
Golden, CO 80401

Cheryl B. Benson
1475 Quaker St.
Golden, CO 80401

Jannett S. Skrydlak
1485 Quaker St.
Golden, CO 80401

Stanley M. Lupinski
1497 Quaker St.
Golden, CO 80401

Pamela S. McManigal
1498 Quaker St.
Golden, CO 80401

Gregory S. Baker
1353 Quaker St. #2
Golden, CO 80401

Brandon J. Keeler
1353 Quaker St. #3
Golden, CO 80401

Xela H. Ellis
1353 Quaker St. #4
Golden, CO 80401

Timothy D. Councilman
1353 Quaker St.
Golden, CO 80401

Thomas P. Maloney
15601 S. Golden Rd.
Golden, CO 80401

Mary Agnes Moore
15655 S. Golden Rd.
Golden, CO 80401

Jeffrey R. Brotherston
15969 S. Golden Rd.
Golden, CO 80401

Geraldine L. Lewis
15995 S. Golden Rd.
Golden, CO 80401

Ronald P. Choronzy
16001 S. Golden Rd.
Golden, CO 80401

Michael D. Peter
16001 S. Golden Rd.
Golden, CO 80401

Susan P. Rossie
16001 S. Golden Rd.
Golden, CO 80401

Charles J. Pinter
16100 S. Golden Rd.
Golden, CO 80401

John W. Fisher
16135 S. Golden Rd.
Golden, CO 80401

Brian A. Beausoleil
16250 S. Golden Rd.
Golden, CO 80401

David J. Christy
16665 S. Golden Rd.
Golden, CO 80401

John D. Allen
16700 S. Golden Rd.
Golden, CO 80401

Cynthia K. Sample
16740 S. Golden Rd.
Golden, CO 80401

Joseph A. Sheehan
16745 Golden Rd.
Golden, CO 80401

Carl E. Brewsaugh
16750 S. Golden Rd.
Golden, CO 80401

Jennifer L. White
16773 S. Golden Rd.
Golden, Co 80401

James F. John
16905 Golden Rd.
Golden, CO 80401

Jackie L. Obammon
16910 S. Golden Rd.
Golden, CO 80401

Julian Clark
16950 S. Golden Rd.
Golden, CO 80401

Dave G. Walther
16985 S. Golden Rd.
Golden, CO 80401

Connie M. Berte
16995 S. Golden Rd.
Golden, CO 80401

Sonya D. Brown
16999 S. Golden Rd.
Golden, CO 80401

Tammy L. Jacobsen
17005 S. Golden Rd.
Golden, CO 80401

Jacquelyn Barnes
17060 S. Golden Rd.
Golden, CO 80401

Kordee L. Shumake
17070 S. Golden Rd.
Golden, CO 80401

June N. Lamgo
17075 S. Golden Rd.
Golden, CO 80401

Christopher L. VanCourt
16100 S. Golden Rd.
Golden, CO 80401

Keith A. Thompson
16200 S. Golden Rd. #1
Golden, CO 80401

Laura J. Rutherford
16100 S. Golden Rd. #13
Golden, CO 80401

Judith C. Strand
16100 S. Golden Rd. #7
Golden, CO 80401

Bobbi J. Levan
16097 S. Golden Rd. A
Golden, CO 80401

Ian P. Lord
16100 S. Golden Rd. #1
Golden, CO 80401

Paul D. Hulett
16100 S. Golden Rd. #14
Golden, CO 80401

Dianna Thomae
16100 S. Golden Rd. #15
Golden, CO 80401

John F. Ferguson
16100 S. Golden Rd. #18
Golden, CO 80401

Thomas N. Snodgrass
16100 S. Golden Rd. #2
Golden, CO 80401

Diane M. Cox
16001 S. Golden Rd. #3
Golden, CO 80401

Lisa J. Sparks
16001 S. Golden Rd. #4
Golden, CO 80401

Heidirika Walts
17190 S. Golden Rd. #47
Golden, CO 80401

Brenda B. Harris
16100 S. Golden Rd. #9
Golden, CO 80401

Mia M. Diller
16100 S. Golden Rd. #15
Golden, CO 80401

Bill R. Deyott
16097 S. Golden Rd. B
Golden, CO 80401

Denise L. Acosta
16200 S. Golden Rd. #2
Golden, CO 80401

Linda G. Watkins
812 Torrey St.
Golden, CO 80401

Larry E. Beery
15795 W. 11th Ave.
Golden, CO 80401

Helene K. Myer
15865 W. 11th Ave.
Golden, CO 80401

Andrea K. Maloney
15875 W. 11th Ave.
Golden, CO 80401

Mary L. Wind
15899 W. 11th Ave.
Golden, CO 80401

Twilla M. Dilworth
16015 W. 11th Ave.
Golden, CO 80401

Brian E. Eggleston
16508 W. 11th Ave.
Golden, CO 80401

Jeremy B. Lechman
16508 W. 11th Ave.
Golden, CO 80401

Angela C. Samudio
16510 W. 11th Ave.
Golden, CO 80401

Laird A. Campbell
16545 W. 11th Ave.
Golden, CO 80401

Dyan R. Walcher
16547 W. 11th Ave.
Golden, CO 80401

George B. Young
16565 W. 11th Ave.
Golden, CO 80401

Cameron J. Cryans
16587 W. 11th Ave.
Golden, CO 80401

Brent A. Wood
16590 W. 11th Ave.
Golden, CO 80401

Tala S. Glantz
16605 W. 11th Ave.
Golden, CO 80401

Brenda K. Newell
16630 W. 11th Ave.
Golden, CO 80401

Peter J. Watkins
16650 W. 11th Ave.
Golden, CO 80401

Barbara Manzanares
16675 W. 11th Ave.
Golden, CO 80401

Gary P. Metze
16680 W. 11th Ave.
Golden, CO 80401

Bonnie B. Palmateer
16682 W. 11th Ave.
Golden, CO 80401

Effie M. Simms
16690 W. 11th Ave.
Golden, CO 80401

Gregory S. Cameron
16700 W. 11th Ave.
Golden, CO 80401

Daniel D. Hollingsworth
16700 W. 11th Ave.
Golden, CO 80401

Suzanne M. Kibel
16701 W. 11th Ave.
Golden, CO 80401

Margaret R. Bruckner
16900 W. 11th Ave.
Golden, CO 80401

Peggy M. Kuretich
16905 W. 11th Ave.
Golden, CO 80401

Rochelle L. Kuretich
16907 W. 11th Ave.
Golden, CO 80401

Chad S. Turner
16925 W. 11th Ave.
Golden, CO 80401

Dennis R. Bandy
16940 W. 11th Ave.
Golden, CO 80401

Catherine D. Phelps
16970 W. 11th Ave.
Golden, CO 80401

Deron S. Dilger
16980 W. 11th Ave.
Golden, CO 80401

Roy C. Greene, Jr.
16999 W. 11th Ave.
Golden, CO 80401

Leona F. Hobbs
17003 W. 11th Dr.
Golden, CO 80401

John G. Ritzman
17004 W. 11th Dr.
Golden, CO 80401

Peggy B. Allen
17006 W. 11th Dr.
Golden, CO 80401

David J. Moon
17035 W. 11th Dr.
Golden, CO 80401

Mathew F. Donnelly
17036 W. 11th Dr.
Golden, CO 80401

Patrick J. Donahue
17053 W. 11th Dr.
Golden, CO 80401

Cindy M. Lefler
17054 W. 11th Dr.
Golden, CO 80401

Jennifer E. Burton
17055 W. 11th Dr.
Golden, CO 80401

Gary W. Truman
17056 W. 11th Dr.
Golden, CO 80401

Fred Martin
15825 W. 11th Pl.
Golden, CO 80401

David H. Borgelt
15864 W. 11th Pl.
Golden, CO 80401

Gordon J. Kennedy
15869 W. 11th Pl.
Golden, CO 80401

Cynthia J. Langman
17009 W. 11th Pl.
Golden, CO 80401

Marie H. Simon Connally
17010 W. 11th Pl.
Golden, CO 80401

William E. Housel
17029 W. 11th Pl.
Golden, CO 80401

Lyman M. Wall
17030 W. 11th Pl.
Golden, CO 80401

Craig D. Roik
17032 W. 11th Pl.
Golden, CO 80401

Marcia A. Lannan
17049 W. 11th Pl.
Golden, CO 80401

Crystal Adams
17050 W. 11th Pl.
Golden, CO 80401

Amanda J. Fox
17051 W. 11th Pl.
Golden, CO 80401

Gary E. Endicott
16935 W. 11th. Ave.
Golden, CO 80401

Paul E. Maloney
15806 W. 12th Ave.
Golden, CO 80401

Richard H. Matthews, Sr.
16091 W. 12th Ave.
Golden, CO 80401

Elizabeth H. Scheiding
16121 W. 12th Ave.
Golden, CO 80401

Constance L. Gerstner
16141 W. 12th Ave.
Golden, CO 80401

Todd A. Isom
16160 W. 12th Ave.
Golden, CO 80401

Vernon A. Loyd
16181 W. 12th Ave.
Golden, CO 80401

Cathy A. Walker
16930 W. 12th Ave.
Golden, CO 80401

Eric A. Behne
16940 W. 12th Ave.
Golden, CO 80401

Penny L. Anderson
16950 W. 12th Ave.
Golden, CO 80401

Danielle Hart
16960 W. 12th Ave.
Golden, CO 80401

Clare A. Hoffman
16991 W. 12th Ave.
Golden, CO 80401

Margot A. Plummer
17001 W. 12th Ave.
Golden, CO 80401

Peter A. Adams
17005 W. 12th Ave.
Golden, CO 80401

Raymond E. Declue
17015 W. 12th Ave.
Golden, CO 80401

Michael S. Foss
17016 W. 12th Ave.
Golden, CO 80401

Margaret A. McMahan
17046 W. 12th Ave.
Golden, CO 80401

Portia H. Masterson
17076 W. 12th Ave.
Golden, CO 80401

Mildred M. Nelson
17155 W. 12th Ave.
Golden, CO 80401

Randy J. Anderson
17165 W. 12th Ave.
Golden, CO 80401

Wayne P. Chismar
17225 W. 12th Ave.
Golden, CO 80401

Andrew E. Price
17215 W. 12th Ave. #3
Golden, CO 80401

Jeanmarie C. Mulnix
17205 W. 12th Ave. #1
Golden, CO 80401

Debra K. Cook
17225 W. 12th Ave. #1
Golden, CO 80401

Eric A. Duerr
17225 W. 12th Ave. #14
Golden, CO 80401

Alfred J. Wade
17225 W. 12th Ave. #15
Golden, CO 80401

Donald A. Jensen
17225 W. 12th Ave. #3
Golden, CO 80401

Mary P. Kent
17215 W. 12th Ave. #4
Golden, CO 80401

Herbert G. Karn
17225 W. 12th Ave. #6
Golden, CO 80401

Patricia M. Brunson
17225 W. 12th Ave. #8
Golden, CO 80401

Drew J. Jenkins
17215 W. 12th Ave. #1
Golden, CO 80401

Wallie Robinson
17225 W. 12th Ave. #10
Golden, CO 80401

Rose Mary Dunn
17225 W. 12th Ave. #5
Golden, CO 80401

Lisa M. Kendall Karn
17225 W. 12th Ave. #6
Golden, CO 80401

James F. Kuehnert
17225 W. 12th Ave. #7
Golden, CO 80401

Pearl L. Benning
17225 W. 12th Ave. #2
Golden, CO 80401

Gary P. Vonfeldt
16465 W. 12th Dr.
Golden, CO 80401

Matthew L. Benson
16470 W. 12th Dr.
Golden, CO 80401

Diana J. Hightower
16473 W. 12th Dr.
Golden, CO 80401

Deann R. Timm
16475 W. 12th Dr.
Golden, CO 80401

Mary E. Kidd
16485 W. 12th Dr.
Golden, CO 80401

Arlen E. Zens
16500 W. 12th Dr.
Golden, CO 80401

Bradley J. Hoover
16508 W. 12th Dr.
Golden, CO 80401

Joseph E. Begeman
16515 W. 12th Dr.
Golden, CO 80401

Tamara W. Holcome
16520 W. 12th Dr.
Golden, CO 80401

Stephen D. Schwochow
16493 W. 12th Pl.
Golden, CO 80401

Jerrilynn Tucker
16535 W. 12th Pl.
Golden, CO 80401

Carl D. Loht
16577 W. 12th Pl.
Golden, CO 80401

Carole L. Korosec
16585 W. 12th Pl.
Golden. CO 80401

Rochelle A. Labout
16600 W. 12th Pl.
Golden, CO 80401

Glenn C. Miller
16650 W. 12th Pl.
Golden, CO 80401

Karen S. Miller
16652 W. 12th Pl.
Golden, CO 80401

Ralph T. Hirtz
16655 W. 12th Pl.
Golden, CO 80401

Laura A. Gasbarra
14935 W. 13th Ave.
Golden, CO 80401

Donna W. Unruh
15001 W. 13th Ave.
Golden, CO 80401

Christine E. Baer
15013 W. 13th Ave.
Golden, CO 80401

Margo A. Green
15090 W. 13th Ave.
Golden, CO 80401

Jeff S. Martin
15100 W. 13th Ave.
Golden, CO 80401

Kerry J. Lidster
15150 W. 13th Ave.
Golden, CO 80401

Richard A. Miccio
15150 W. 13th Ave.
Golden, CO 80401

Mary J. Fleming
15700 W. 13th Ave.
Golden, CO 80401

Anne M. Simms
15705 W. 13th Ave.
Golden, CO 80401

Terri L. Feldkamp
15776 W. 13th Ave.
Golden, CO 80401

Jennifer L. Kelsey
15800 W. 13th Ave.
Golden, CO 80401

Adrienne E. Bergstrom
15805 W. 13th Ave.
Golden, CO 80401

Vicki L. Noeth
15830 W. 13th Ave.
Golden, CO 80401

Phillip J. Paulter
15835 W. 13th Ave.
Golden, CO 80401

Margaret H. Dee
15850 W. 13th Ave.
Golden, CO 80401

Katherine L. Porter
15855 W. 13th Ave.
Golden, CO 80401

Kee J. Hincher
15880 W. 13th Ave.
Golden, CO 80401

Curtis H. Erickson
15900 W. 13th Ave.
Golden, CO 80401

Nora D. Bates
15905 W. 13th Ave.
Golden, CO 80401

Ann B. Hansen
15930 W. 13th Ave.
Golden, CO 80401

Anne J. Schuster
15935 W. 13th Ave.
Golden, CO 80401

Lynne M. Otool
15985 W. 13th Ave.
Golden, CO 80401

Jean E. Hanna
16042 W. 13th Ave.
Golden, CO 80401

Ann R. Mills
16043 W. 13th Ave.
Golden, CO 80401

Andrew L. George
16092 W. 13th Ave.
Golden, CO 80401

Gladys Klein
16093 W. 13th Ave.
Golden, CO 80401

Jason M. Haines
16122 W. 13th Ave.
Golden, CO 80401

Wendall R. Lehmkuhl
16123 W. 13th Ave.
Golden, CO 80401

Shawn M. Yasutake
16142 W. 13th Ave.
Golden, CO 80401

Marlene A. Pates
16162 W. 13th Ave.
Golden, CO 80401

Lucas J. Santilli
16163 W. 13th Ave.
Golden, CO 80401

Chester L. Stockton
16182 W. 13th Ave.
Golden, CO 80401

Colleen M. Olson
16210 W. 13th Ave.
Golden, CO 80401

Darlene M. Besser
16213 W. 13th Ave.
Golden, CO 80401

William W. Clark, III
16215 W. 13th Ave.
Golden, CO 80401

Courtney R. Armenta
16230 W. 13th Ave.
Golden, CO 80401

Marilyn V. Bergan
16233 W. 13th Ave.
Golden, CO 80401

Kay E. Taylor
16235 W. 13th Ave.
Golden, CO 80401

Lacinda D. Strand
16250 W. 13th Ave.
Golden, CO 80401

Pamela G. Caidin
16252 W. 13th Ave.
Golden, CO 80401

Rebecca L. Rundquist
16253 W. 13th Ave.
Golden, CO 80401

Diane H. Mullin
16255 W. 13th Ave.
Golden, CO 80401

Byron E. Sauve
16270 W. 13th Ave.
Golden, CO 80401

Patricia A. Roe
16272 W. 13th Ave.
Golden, CO 80401

Robert E. Clark
16273 W. 13th Ave.
Golden, CO 80401

Roni M. Zurcher
16275 W. 13th Ave.
Golden, CO 80401

Christine D. Parkhurst
16292 W. 13th Ave.
Golden, CO 80401

Tina F. Gabel
16293 W. 13th Ave.
Golden, CO 80401

Deborah J. Schmock
16294 W. 13th Ave.
Golden, CO 80401

Elma Lumbert
16295 W. 13th Ave.
Golden, CO 80401

Erick M. Bartosh
16340 W. 13th Ave.
Golden, CO 80401

Rebeca H. White
15150 W. 13th Ave. E
Golden, CO 80401

Christopher G. Hudson
16267 W. 13th Pl
Golden, CO 80401

David B. Falls
15880 W. 13th Pl.
Golden, CO 80401

Adan I. Saez
15890 W. 13th Pl.
Golden, CO 80401

Cathy J. Crane
15895 W. 13th Pl.
Golden, CO 80401

Roy E. Morton, Jr.
15925 W. 13th Pl.
Golden, CO 80401

Chester A. Hurley, Jr.
15930 W. 13th Pl.
Golden, CO 80401

Anna L. Ellsworth
15940 W. 13th Pl.
Golden, CO 80401

Roy E. Bergquist
15970 W. 13th Pl.
Golden, CO 80401

Ellen D. Weekley
15980 W. 13th Pl.
Golden, CO 80401

Morris D. Lund
16044 W. 13th Pl.
Golden, CO 80401

Michael G. Spak
16045 W. 13th Pl.
Golden, CO 80401

Sondra K. Simmons
16094 W. 13th Pl.
Golden, CO 80401

Rosemary Lauer
16095 W. 13th Pl.
Golden, CO 80401

Frieda D. Wypyhoski
16124 W. 13th Pl.
Golden, CO 80401

Linda L. Hughes
16125 W. 13th Pl.
Golden, CO 80401

Karen M. Brungardt
16144 W. 13th Pl.
Golden, CO 80401

Cherie L. Hudson
16145 W. 13th Pl.
Golden, CO 80401

Xi Xi
16164 W. 13th Pl.
Golden, CO 80401

La Vonne E. Benjamin
16165 W. 13th Pl.
Golden, CO 80401

Greta I. Alenius
16184 W. 13th Pl.
Golden, CO 80401

Betty D. Batholomew
16185 W. 13th Pl.
Golden, CO 80401

Gregory W. Williams
16266 W. 13th Pl.
Golden, CO 80401

Veralynn A. Mecham
16268 W. 13th Pl.
Golden, CO 80401

Robert H. Jr. Kelder
16296 W. 13th Pl.
Golden, CO 80401

Vonda M. Alden
16298 W. 13th Pl.
Golden, CO 80401

Robert L. Cain
16299 W. 13th Pl.
Golden, CO 80401

Michael J. Bye
16338 W. 13th Pl.
Golden, CO 80401

Gail L. Pratt
16339 W. 13th Pl.
Golden, CO 80401

Mary J. Gray
16340 W. 13th Pl.
Golden, CO 80401

Craig D. Petersen
16370 W. 13th Pl.
Golden, CO 80401

Joseph R. Detaranto, III
15975 W. 13th Pl.
Golden, CO 80401

Michael P. Rosenthal
15760 W. 14th Ave
Golden, CO 80401

Lenora E. Wichmann
14985 W. 14th Ave.
Golden, CO 80401

Ethelmae Quayle
15005 W. 14th Ave.
Golden, CO 80401

Colleen N. Crocker
15101 W. 14th Ave.
Golden, CO 80401

Dorothy K. Roberts
15160 W. 14th Ave.
Golden, CO 80401

Julie R. Gerdes
16241 W. 14th Ave.
Golden, CO 80401

Shauna A. Johnsonn
16251 W. 14th Ave.
Golden, CO 80401

Jim J. Verstraten
16260 W. 14th Ave.
Golden, CO 80401

Debra L. Waller
16271 W. 14th Ave.
Golden, Co 80401

Sean S. Griffith
16280 W. 14th Ave.
Golden, CO 80401

Robert Wilber
16281 W. 14th Ave.
Golden, CO 80401

Brett E. Miner
16300 W. 14th Ave.
Golden, CO 80401

Glendlyn S. Hogan
16301 W. 14th Ave.
Golden, CO 80401

Erica N. Enright
16310 W. 14th Ave.
Golden, Co 80401

Michael J. Enright
16325 W. 14th Ave.
Golden, CO 80401

Bonnie J. Bartosh
16341 W. 14th Ave.
Golden, CO 80401

Judith M. Hankin
16345 W. 14th Ave.
Golden, Co 80401

Barbara A. Hancock
16350 W. 14th Ave.
Golden, CO 80401

Janine Rowsey
16351 W. 14th Ave.
Golden, CO 80401

Susan M. Saegel
16359 W. 14th Ave.
Golden, CO 80401

Joseph R. Leger
15800 W. 14th Pl.
Golden, CO 80401

Laura A. Longrigg
15805 W. 14th Pl.
Golden, CO 80401

Cindy L. ORiley
15830 W. 14th Pl.
Golden, CO 80401

Lou Linda Zilge
15850 W. 14th Pl.
Golden, CO 80401

Angelo Banuelos
15875 W. 14th Pl.
Golden, CO 80401

Dominick L. Blum
15875 W. 14th Pl.
Golden, CO 80401

William M. Schrorer
15880 W. 14th Pl.
Golden, CO 80401

Mark A. Earhart
15895 W. 14th Pl.
Golden, CO 80401

Robert B. Johnson
15895 W. 14th Pl.
Golden, CO 80401

Clyde M. Harber
15900 W. 14th Pl.
Golden, CO 80401

Janice E. Weaver
15905 W. 14th Pl.
Golden, CO 80401

Shirley M. Spillman
15920 W. 14th Pl.
Golden, CO 80401

Gloria M. Splant
15925 W. 14th Pl.
Golden, CO 80401

Elva E. Brock
15950 W. 14th Pl.
Golden, CO 80401

Todd A. Hunter
15955 W. 14th Pl.
Golden, CO 80401

Stephanie M. Morse
15995 W. 14th Pl.
Golden, CO 80401

Harry A. Huizenga
16005 W. 14th Pl.
Golden, CO 80401

Cynthia J. Charbonneau
16030 W. 14th Pl.
Golden, CO 80401

Danna K. Jennison
16035 W. 14th Pl.
Golden, CO 80401

Patricia Myers
16035 W. 14th Pl.
Golden, CO 80401

Veronica A. Yada
16035 W. 14th Pl.
Golden, CO 80401

Helen E. Meacham
16070 W. 14th Pl.
Golden, CO 80401

Claude D. Briles
16075 W. 14th Pl.
Golden, CO 80401

Claribelle E. Stow
16090 W. 14th Pl.
Golden, CO 80401

Tracy F. Walker
16095 W. 14th pl.
Golden, CO 80401

Amy M. Stow
16100 W. 14th Pl.
Golden, CO 80401

Bert L. Denison
16105 W. 14th Pl.
Golden, CO 80401

Jennifer R. Airhart
16130 W. 14th Pl.
Golden, CO 80401

Frances A. Leadford
16135 W. 14th Pl.
Golden, CO 80401

Geoffrey G. Snow
16150 W. 14th Pl.
Golden, CO 80401

Barbara L. Riley
16155 W. 14th Pl.
Golden, CO 80401

Carl A. Pangle
16185 W. 14th Pl.
Golden, CO 80401

Dorene K. Basemann
16435 W. 14th Pl.
Golden, CO 80401

Bruce A. Mayer
16450 W. 14th Pl.
Golden, CO 80401

David A. Orosz
16707 W. 14th Pl.
Golden, CO 80401

Laura E. Degroat
16824 W. 14th Pl.
Golden, CO 80401

Deborah K. Powell
16832 W. 14th Pl.
Golden, CO 80401

Miguel Cardoso
16838 W. 14th Pl.
Golden, CO 80401

Rhonda R. Ray
16858 W. 14th Pl.
Golden, CO 80401

Robert E. Henderson
16859 W. 14th Pl.
Golden, CO 80401

Nicole M. Albert
16860 W. 14th Pl.
Golden, CO 80401

Patricia A. Reid
16868 W. 14th Pl.
Golden, CO 80401

Lori A. Belfor
16870 W. 14th Pl.
Golden, CO 80401

Rachael M. Gonzales
16890 W. 14th Pl.
Golden, CO 80401

Nancy M. Saxton
1500 W. 15th Ave.
Golden, CO 80401

Edwin L. Saxton
15000 W. 15th Ave.
Golden, CO 80401

Barbara A. Morris
16520 W. 15th Ave.
Golden, CO 80401

Robert W. Morris
16525 W. 15th Ave.
Golden, CO 80401

Katherine L. Condon
16725 W. 15th Ave.
Golden, CO 80401

Gary J. Calderone
16735 W. 15th Ave.
Golden, CO 80401

Timothy B. Sigwarth
16740 W. 15th Ave.
Golden, CO 80401

James L. Johnston
16745 W. 15th Ave.
Golden, CO 80401

Jack E. Cavender, Jr.
16775 W. 15th Ave.
Golden, CO 80401

Susa Zoetmulder Knudson
16777 W. 15th Ave.
Golden, CO 80401

Jeremy D. Foster
16785 W. 15th Ave.
Golden, CO 80401

Sandra J. Miorelli
16840 W. 15th Ave.
Golden, CO 80401

Chris E. Wilson
16880 W. 15th Ave.
Golden, CO 80401

Pamella S. McDowell
16885 W. 15th Ave.
Golden, CO 80401

Brian R. Pamperin
16860 W. 15th Ave. A
Golden, CO 80401

Mr. Jim Green
State Historic Pres. Office
1300 Broadway
Denver, CO 80203

Colorado Environmental Coalition, Inc
1536 Wynkoop
Denver, CO 80202

Manish Blair
Air Pollution Control Division
CDPHE
4300 Cherry Creek Dr. So.
Denver, CO 80246

Mr. Wes Wilson
NEPA Compliance, 8WMEA
EPA Region VII
999 18th Street
Denver, CO 80202-2466

Colorado Coop Fish & Wildlife Unit
Dept. Fishery and Wildlife Biology
201 Wagner Building, CSU
Fort Collins, CO 80523-1484

Assessor's Office
Jefferson County
100 Jefferson County Pkwy
Golden, CO 80419

Mr. David Field
Jefferson Co. Planning & Zoning Off.
100 Jefferson County Pkwy., Ste. 3550
Golden, CO 80419-3550

Chris Wooley
Wildfire Mitigation Specialist
Jefferson County Emergency Mgmt
1504 Quaker Street
Golden, CO 80401-2956

Michael A. Lynam
16930 W. 15th Ave.
Golden, CO 80401

Christopher C. Jr. Beebe
16727 W. 15th St.
Golden, CO 80401

Executive Director's Office
Colorado Dept. of Natural Resources
1313 Sherman Street, Room 718
Denver, CO 80203

Colorado Office of Energy Management and Conservation
225 E. 16th Ave, Suite 650
Denver, CO 80203

Water Quality Division
CDPHE
4300 Cherry Creek Dr. So.
Denver, CO 80246

Mr. Grady Towns
Denver Regional Office
US Fish and Wildlife Service
P.O. Box 25486
Denver, CO 80225

Mr. Randy Christiansen
United Power #5 Grouse Dam Rd.
Golden, CO 80403

Highways and Transportation
Jefferson County
100 Jefferson County Pkwy., Ste. 3500
Golden, CO 80419-3500

Ms. Judy Peratt
Jefferson Co. Emergency Preparedness
100 Jefferson County Pkwy, Suite 4570
Golden, CO 80419

Mr. Bruce Colter
Golden District Office
Colorado State Forest Service
1504 Quaker Street
Golden, CO 80401-2956

Connie E. Regner
16970 W. 15th Ave.
Golden, CO 80401

Lyle H. McClure
16080 W.12th Ave.
Golden, CO 80401

Mr. Duane Bollig
Division Land Manager
Lafarge, Inc
1400 W. 64th Ave.,
P.O. Box 215001
Denver, CO 80221

Ms. Rebecca Vickers
Environmental Services
CO Transportation Dept. Empire Park
4201 E. Arkansas Ave.
Denver, CO 80222

Office of the Environment
CDPHE
4300 Cherry Creek Dr. So.
Denver, CO 80246

Ms. Kristine Pollard
Office of Senator Wayne Allard
7340 E. Caley, Suite 215
Englewood, CO 80111

Ms. Nanette Neelon
Special Projects Coordinator
Jefferson County
100 Jefferson County Pkwy
Golden, CO 80419-3500

Mr. Preston Gibson, AICP
Planning and Engineering Mgr.
Jefferson Co. Planning & Zoning Off.
100 Jefferson County Pkwy, Ste. 3550"
Golden, CO 80419-3550

Mr. Vince Auriemma
Golden Public Works Office
City of Golden
1445 10th Street
Golden, CO 80401

Mr. Allen Gallamore
Golden District Office
Golden District Forester
1504 Quaker Street
Golden, CO 80401-2956

Mr. Randy Frank
Jefferson County Open Space
700 Jefferson County Pkwy, Ste.100
Golden, CO 80419

Mr. Gary Finstad
Natural Resource Conservation Service - Metro Office
U.S. Department of Agriculture
655 Parfet, Room E-300
Lakewood, CO 80215-5517

Mr. Ed Backstrom
Conservation Districts
Colorado Association of Soil
3000 Youngfield, Suite #163
Lakewood, CO 80215

Mr. LeRoy Carlson
Colorado Field Supervisor
US Dept - Interior Fish & Wildlife Serv.
755 Parfet St., Rm 361
Lakewood, CO 80215

Sandra Newkirk
13257 W. 26th Avenue
Golden, CO 80401

Mr. Michael Smyth
Planner
Jefferson Cty. Planning& Zoning
100 Jefferson Cty. Pky, Ste.3550
Golden, CO 80419

Mr. John Lahr
1925 Foothills Rd.
Golden, CO 80402

Northwest Mountain Office
Federal Aviation Administration
1601 Lind Avenue SW
Renton, WA 98055-4056

Environmental Health Division
Jefferson County Dept. of Health
260 South Kipling Street
Lakewood, CO 80226

Ecolological Science Dept.
Soil Conservation Service
655 Parfet Street Room E20C
Lakewood, CO 80215

Mr. Doug Young
Office of Representative Mark Udall
1333 West 120th Ave., Suite 210
Westminster, CO 80234

Mr. Ed Lantz
Lantz Associates
13335 W. 72nd Circle
Arvada, CO 80005

Mr. Don Parker
Save the Mesas
305 Lookout View Dr.
Golden, CO 80419

Eugene H. Backhaus
District Conservationist
U.S. Department of Agriculture
655 Parfet, Room E-300
Lakewood, CO 80215-5517

Environmental Compliance Office
Bureau of Land Management
2850 Youngfield St.
Lakewood, CO 80215

Mr. Jim Miller
Dir. of Policy & Communication
CO Dept. of Agriculture
700 Kipling Street, Suite 4000
Lakewood, CO 80215

Ms. Carmi McLean, Executive Dir.
Colorado/Rockies Region
Clean Water Action
899 Logan Street, Suite 101
Denver, CO 80203

Mr. Karl E. Bucholz
Principal Traffic Engineer
City of Lakewood
480 S. Allison Parkway
Lakewood, CO 8026-3127

Jen White
17301 Rimrock Dr.
Golden, CO 80401

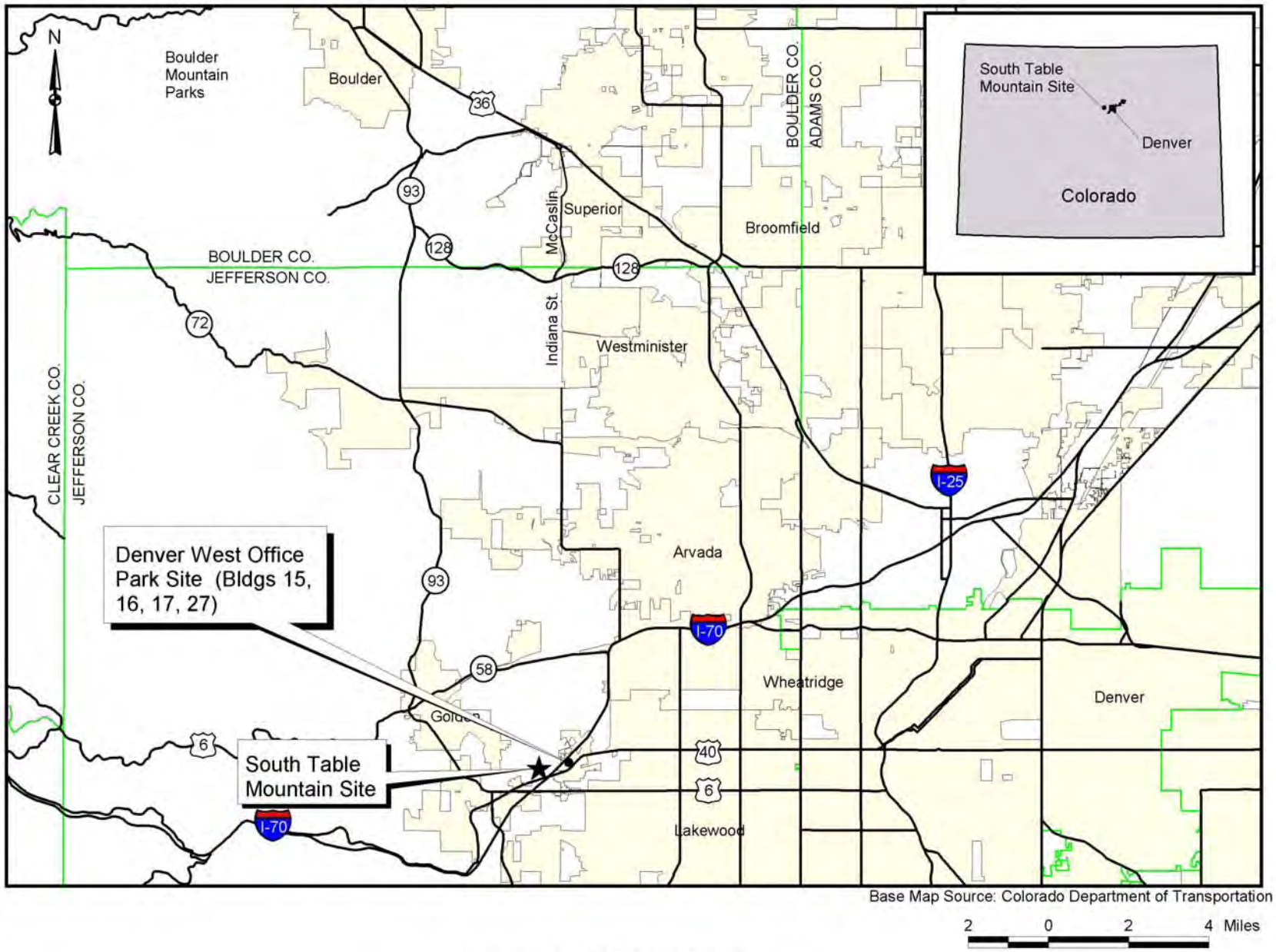


Figure 1-1 Regional Location Map

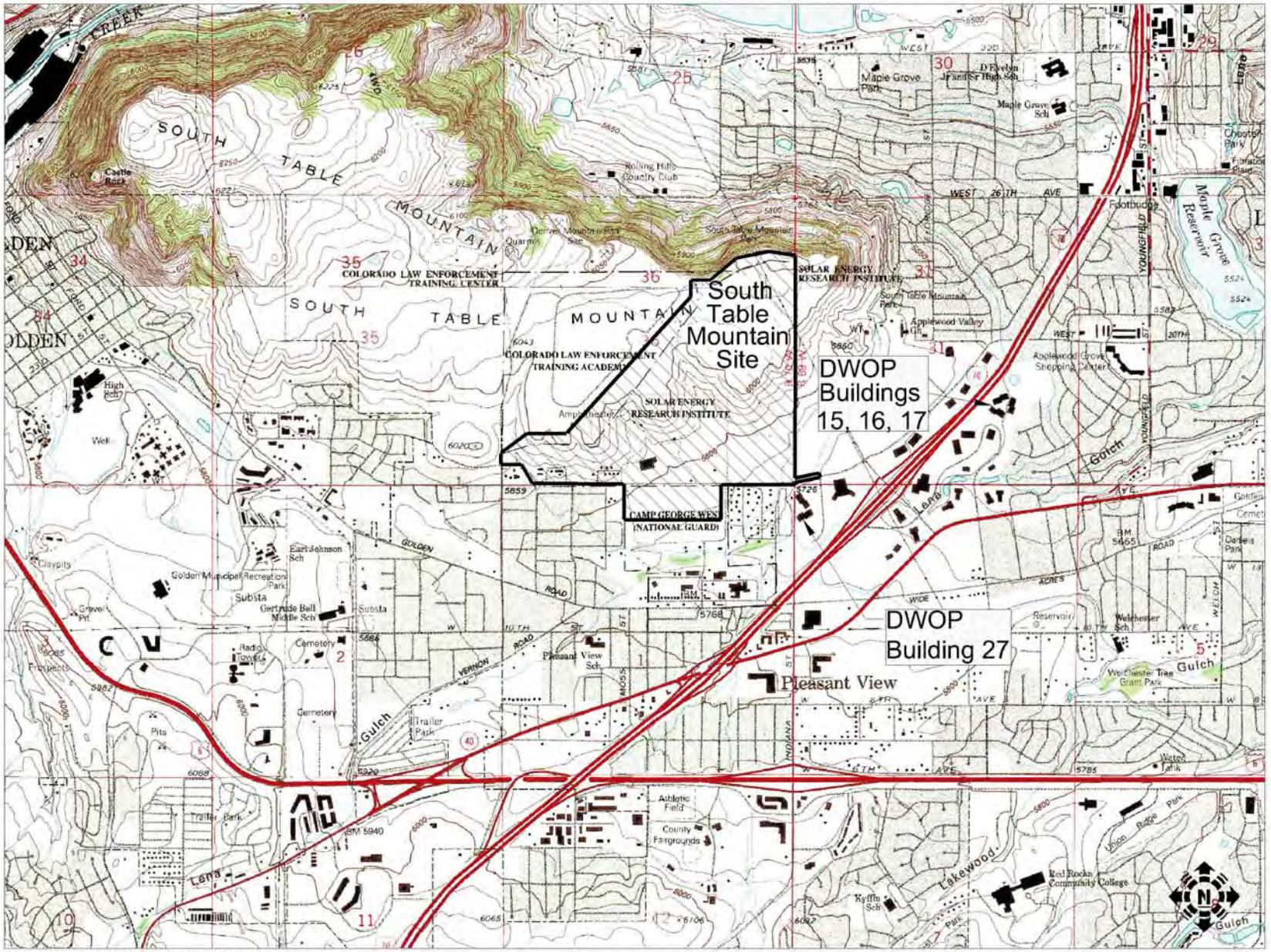


Figure 1-2 Local Setting Map

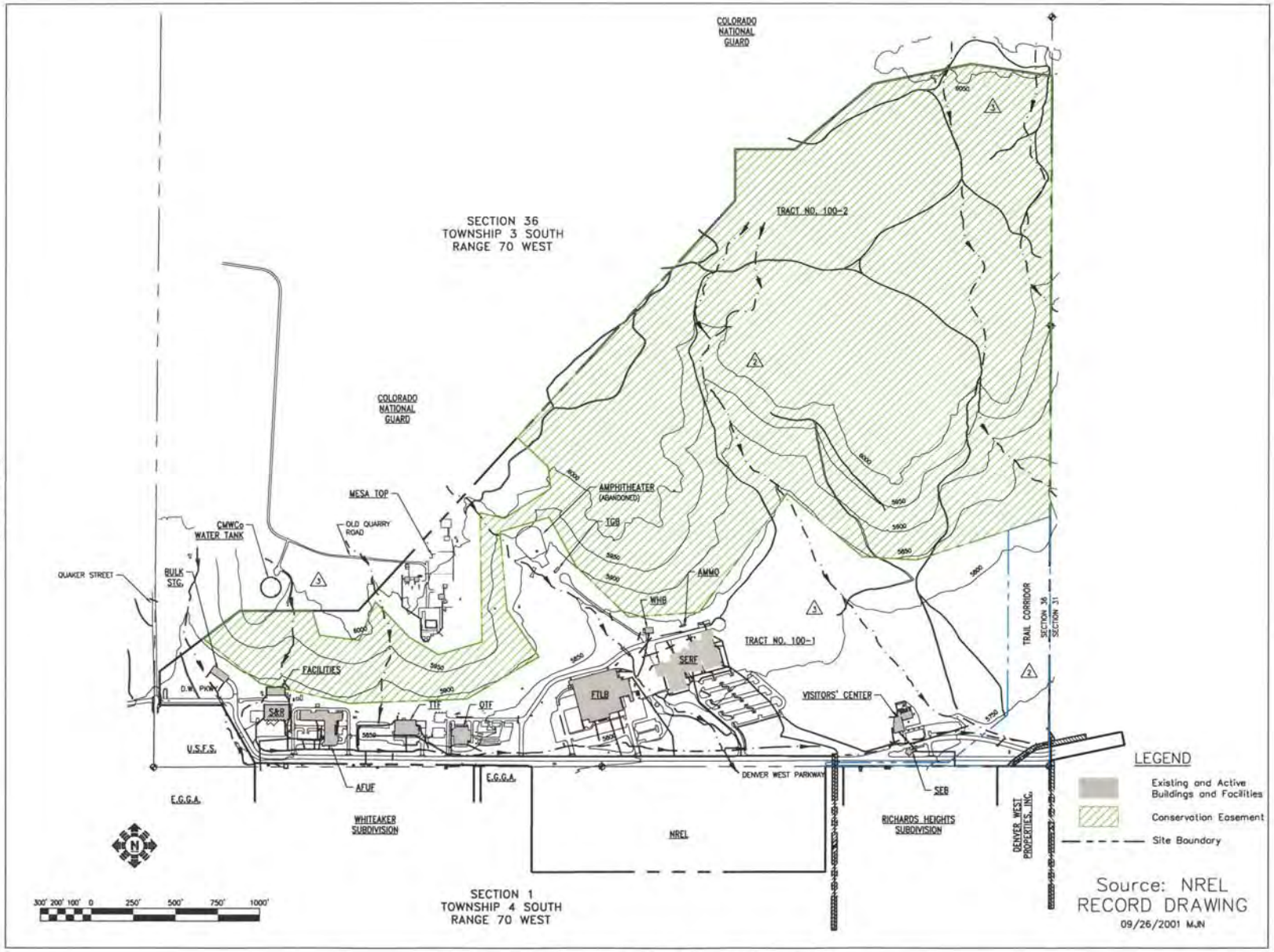


Figure 1-3 South Table Mountain Site Map

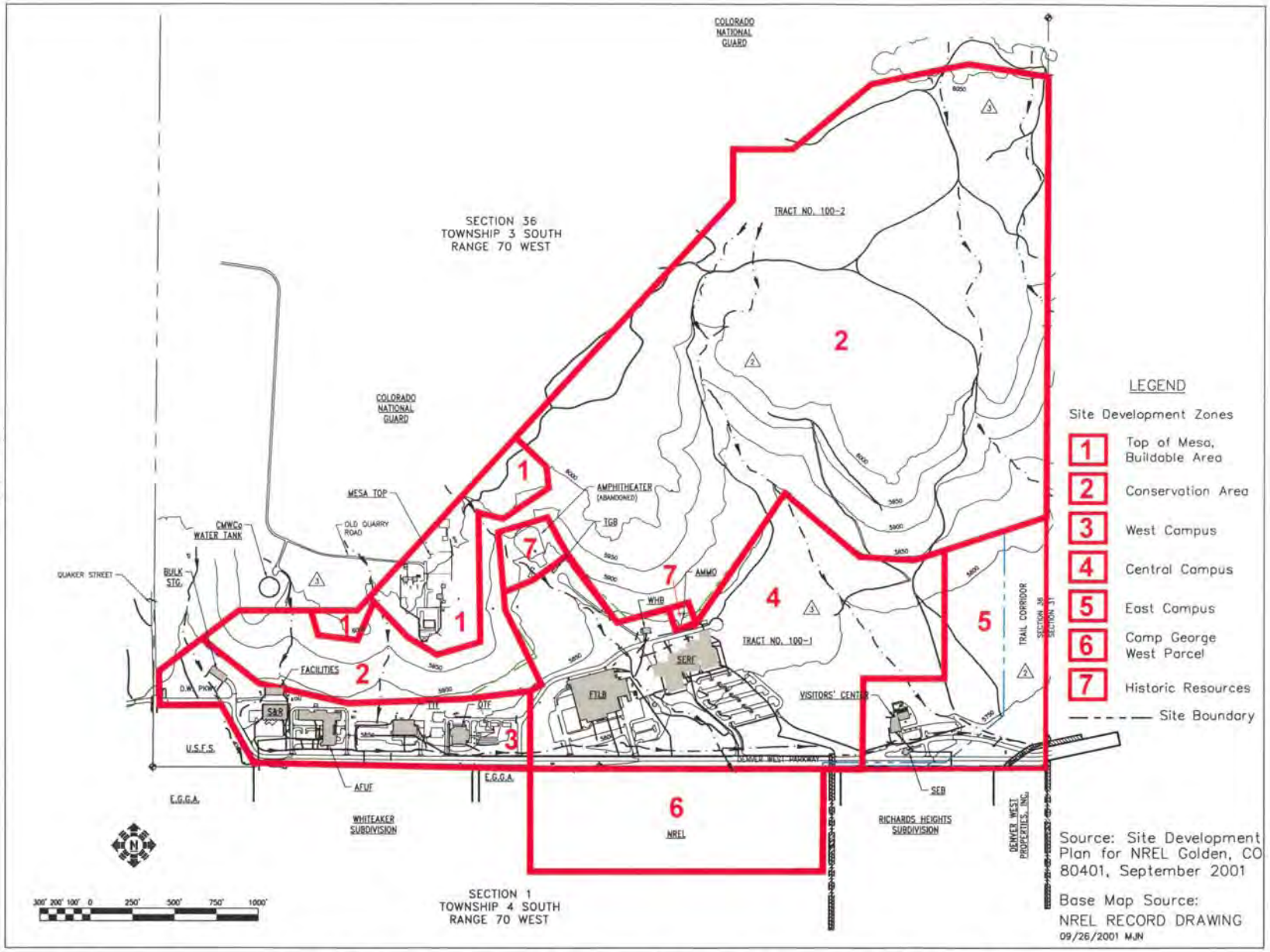
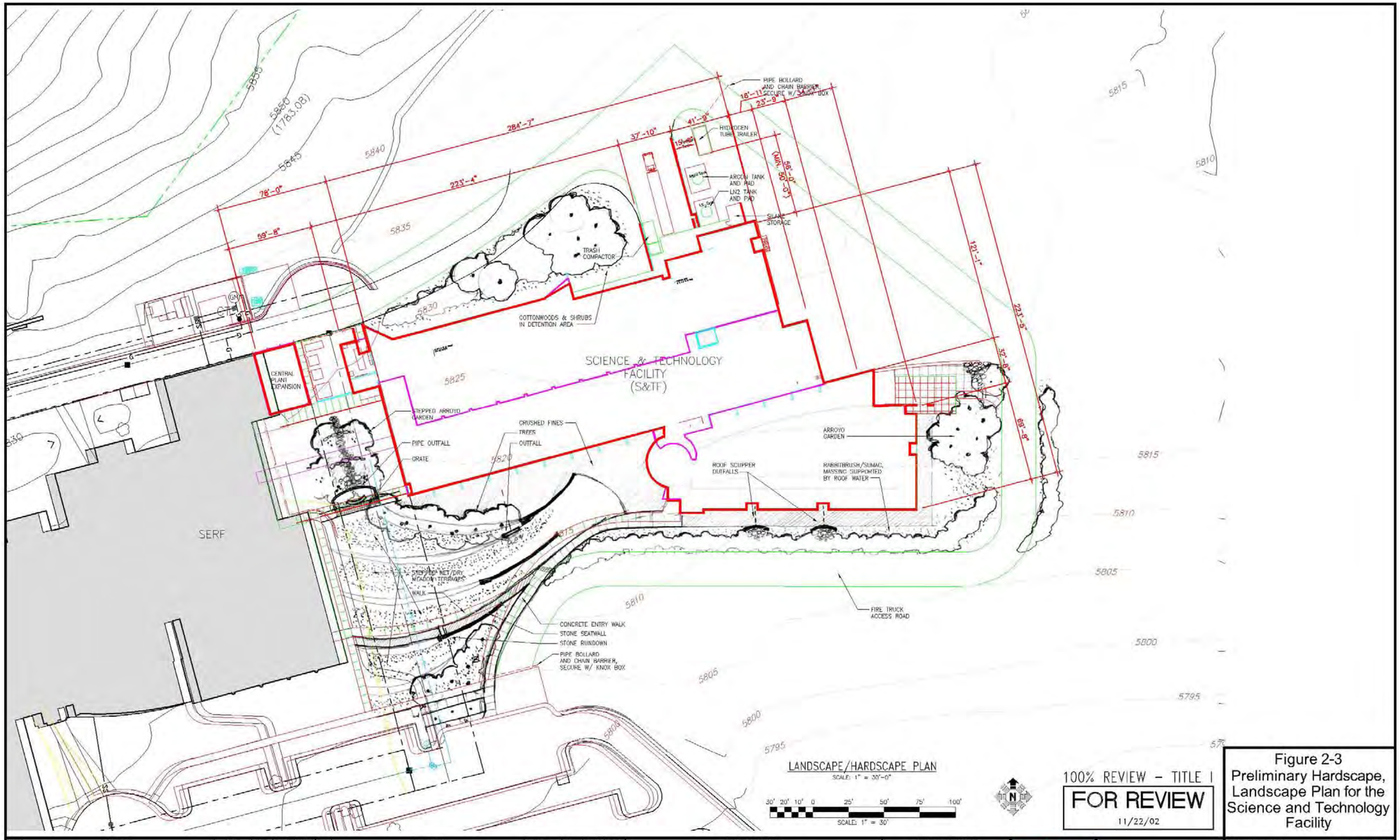


Figure 2-1 Site Development Zones and Proposed Improvements at the STM Site



LANDSCAPE/HARDSCAPE PLAN

SCALE: 1" = 30'-0"

30' 20' 10' 0 25' 50' 75' 100'

SCALE: 1" = 30'

100% REVIEW – TITLE I

FOR REVIEW

11/22/02

Figure 2-3
Preliminary Hardscape, Landscape Plan for the Science and Technology Facility

NO.	REVISIONS	DATE	BY	APP'D.	BAE
A	PRELIMINARY DESIGN 50% SUBMITTAL – FOR NREL REVIEW	09/17/02	MLK	GS	RET
B	PRELIMINARY DESIGN 100% SUBMITTAL – FOR NREL REVIEW	11/22/02	MLK	GS	RET

FILE INFORMATION				
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PLOT INFO.: NREL.STB				

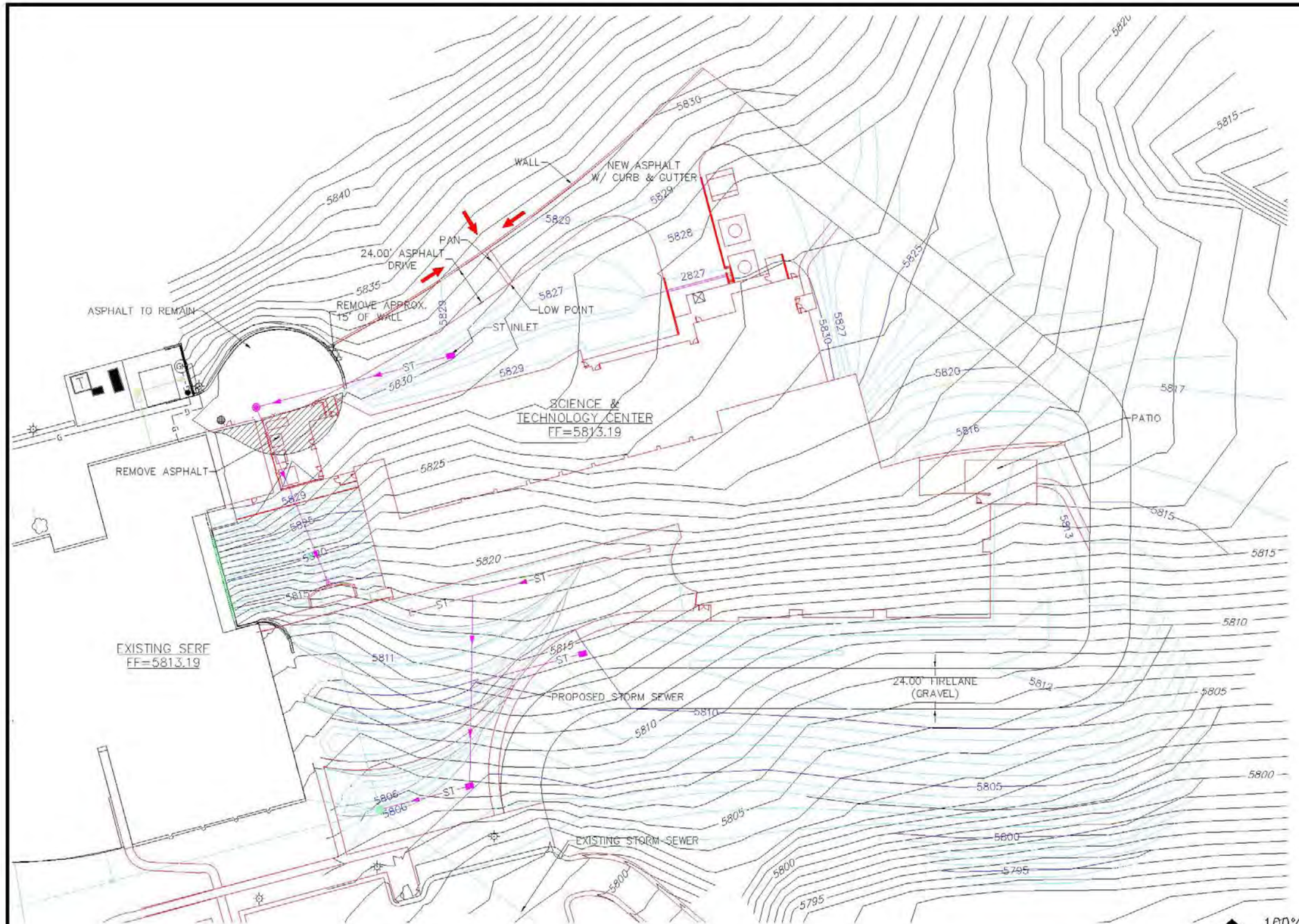
ENGINEERING REVIEW	APPROVAL	DATE
DESIGNER	MLK	9/17/02
ENGINEER	-	-
CHECKED BY	GS	9/17/02
A/E APPROVED BY	-	-
NREL APPROVED BY	-	-
BLDG. AREA ENG.	-	-

SmithGroup

NREL
National Renewable Energy Laboratory
1617 Cole Boulevard
Golden, Colorado 80401-3393
Operated for the U.S. Department of Energy by Midwest Research Institute - Battelle - Bechtel

PERMANENT SITE ARCHITECTURAL
HARDSCAPE / LANDSCAPE PLAN
SCIENCE & TECHNOLOGY FACILITY – TITLE I

DRAWING NO. PREFIX	DRAWING NO.	REVISION NO.
PERM-033-	A-114	B
NREL PROJECT NO.	NREL WORK ORDER NO	A/E PROJECT NO.
EX20020101	W0042728	19458.000



LEGEND

EXISTING		PROPOSED
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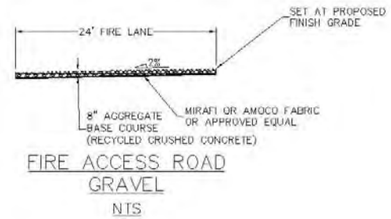
	MANHOLE	
	STORM SEWER	ST
	INLET	
	FLARED END SECTION	



FIRE ACCESS ROAD GRAVEL
NTS

Plan prepared by MARTIN/MARTIN.

MARTIN/MARTIN assumes no responsibility for utility locations. The utilities shown on this drawing have been plotted from the best available information. It is, however, the contractors responsibility to field verify the location of all utilities prior to the commencement of any construction.

SCALE 1"=60'

100% REVIEW – TITLE I

FOR REVIEW

11/22/02

Figure 2-4
Preliminary Site Grading and Drainage Plan for the Science and Technology Facility

NO.	REVISIONS	DATE	BY	APP'D.	BAE
A	PRELIMINARY DESIGN 50% SUBMITTAL – FOR NREL REVIEW	9/17/02	RJP	RJP	RET
B	PRELIMINARY DESIGN 100% SUBMITTAL – FOR NREL REVIEW	11/22/02	JAW	RJP	RET

FILE INFORMATION				
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PLATFORM: Microsoft Windows NT Version 5.0 (x86)				
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PLOT INFO.: MM_NREL.STB				

ENGINEERING REVIEW		
	APPROVAL	DATE
DESIGNER	RJP	9/17/02
ENGINEER	-	-
CHECKED BY	RJP	9/17/02
A/E APPROVED BY		
NREL APPROVED BY	-	-
BLDG. AREA ENG.		

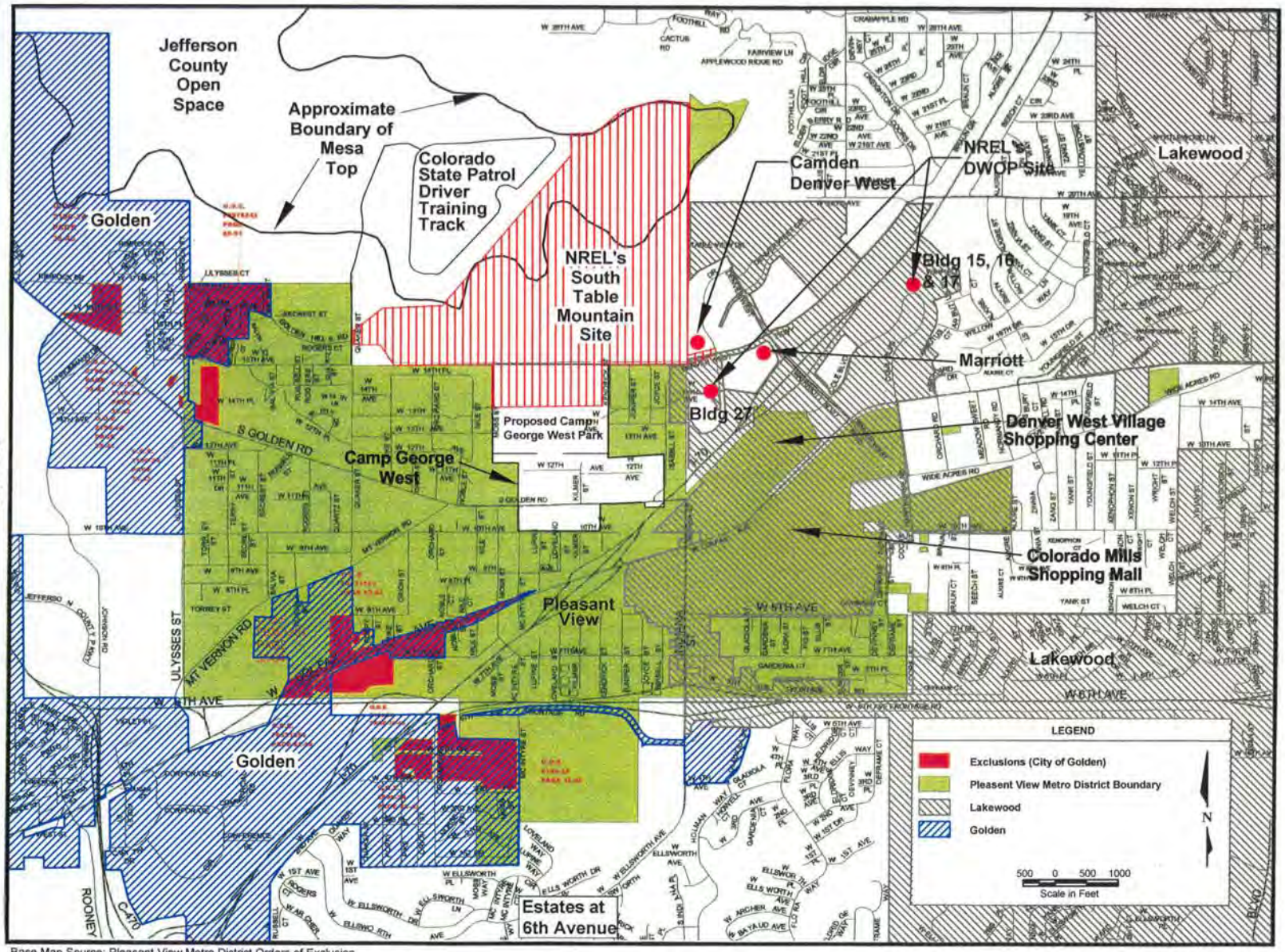
SmithGroup
SmithGroup Incorporated
2800 North Central Avenue
Suite 1200
Phoenix, Arizona 85004
t 602.265.3200
f 602.265.3244

NREL
National Renewable Energy Laboratory
1617 Cole Boulevard
Golden, Colorado 80401-3393
Operated for the U.S. Department of Energy by Midwest Research Institute • Battelle • Bechtel

PERMANENT SITE SITE GRADING & DRAINAGE PLAN — CIVIL

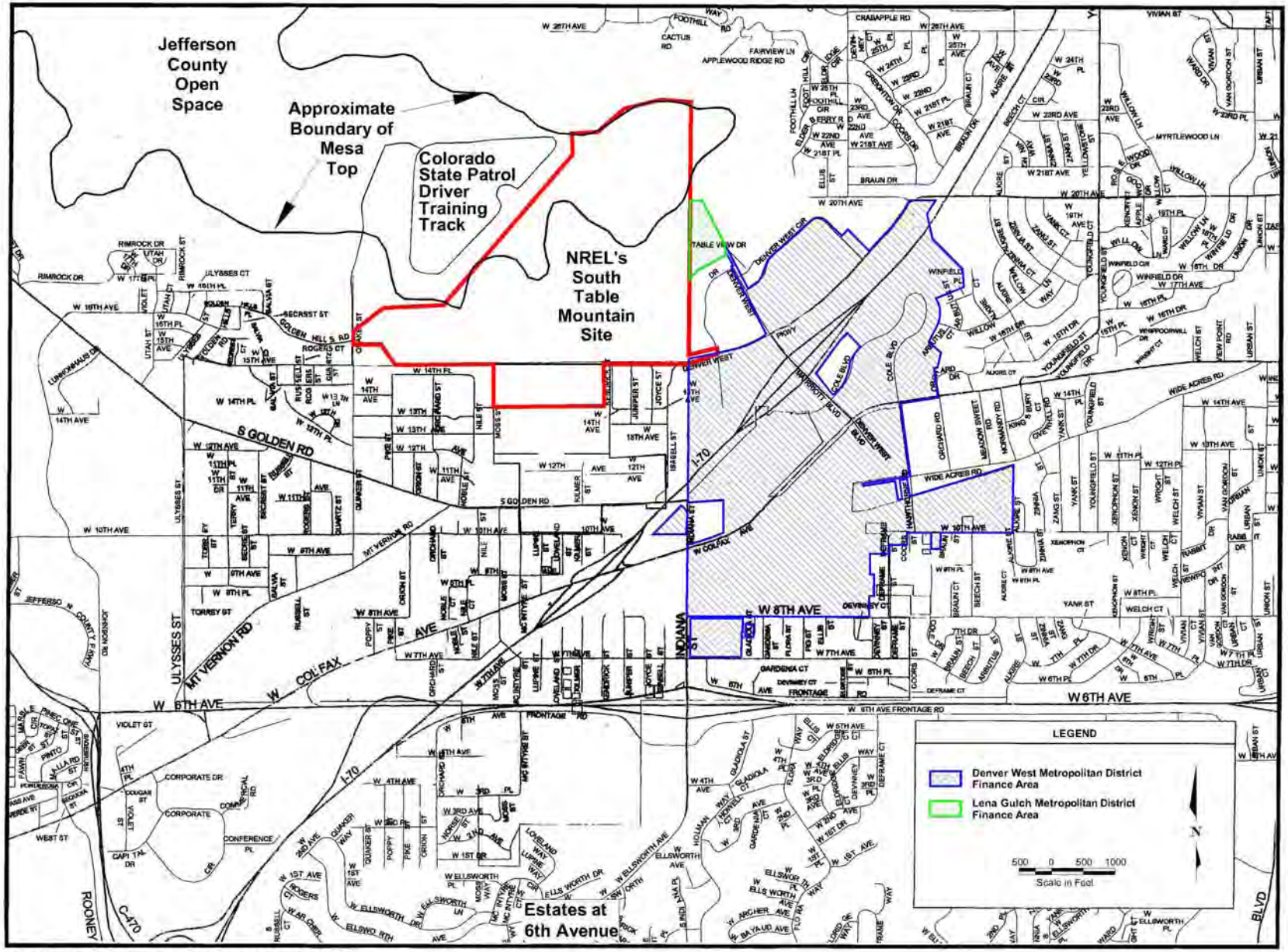
SCIENCE & TECHNOLOGY FACILITY – TITLE I

DRAWING NO. PREFIX	DRAWING NO.	REVISION NO.
PERM-033-	C-112	B
NREL PROJECT NO.	NREL WORK ORDER NO.	A/E PROJECT NO.
EX20020101	W0042728	19458.000



Base Map Source: Pleasant View Metro District Orders of Exclusion
Lakewood and Golden City Boundaries Provided by: Colorado Department of Transportation

Figure 3-1 Land Use and Local Jurisdiction Boundaries



Base Map Source: Pleasant View Metro District Orders of Exclusion

Figure 3-2 Metropolitan District Finance Area Boundaries

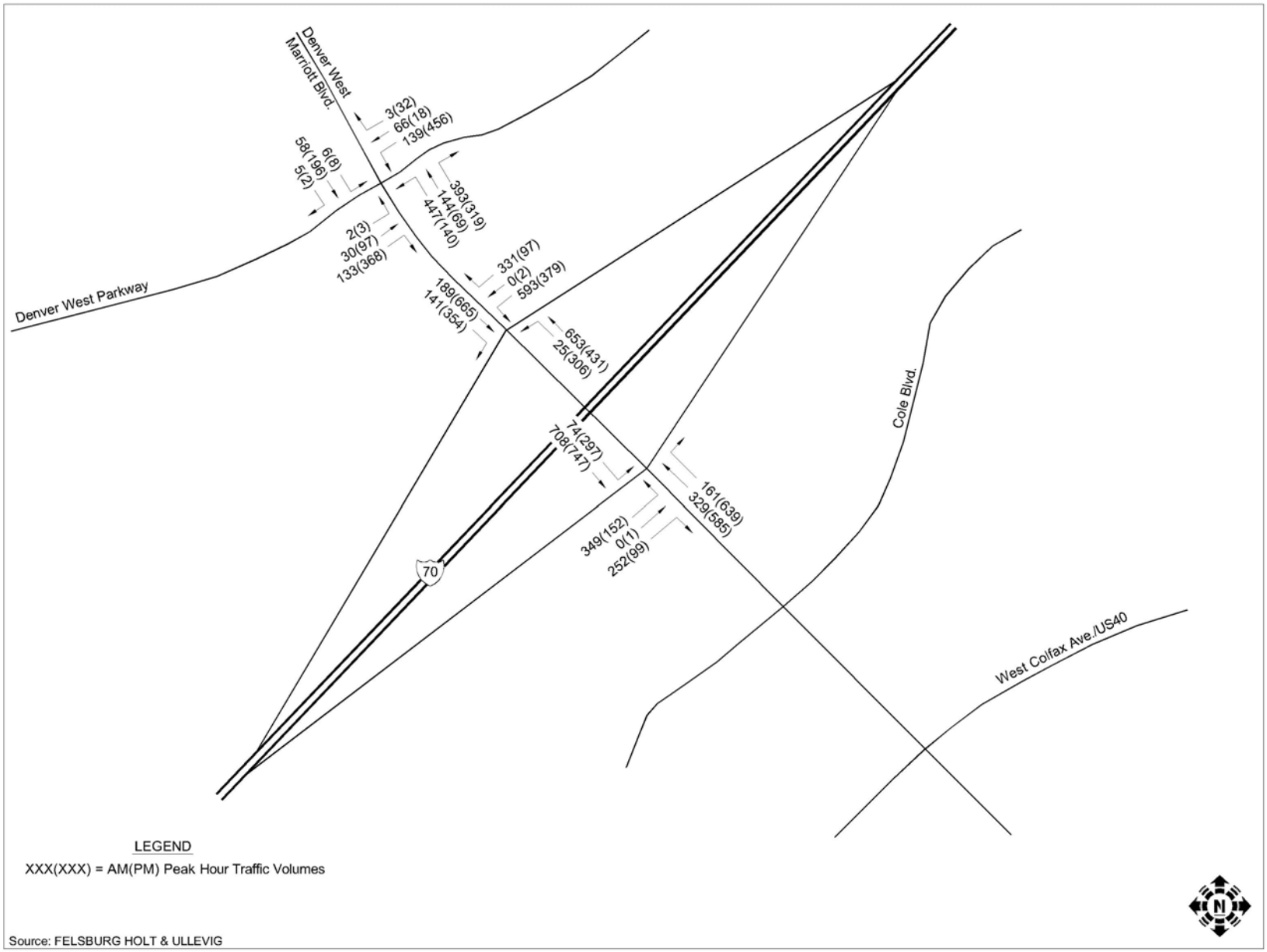


Figure 3-3 August 2002 Daily Peak Hour Traffic Volumes

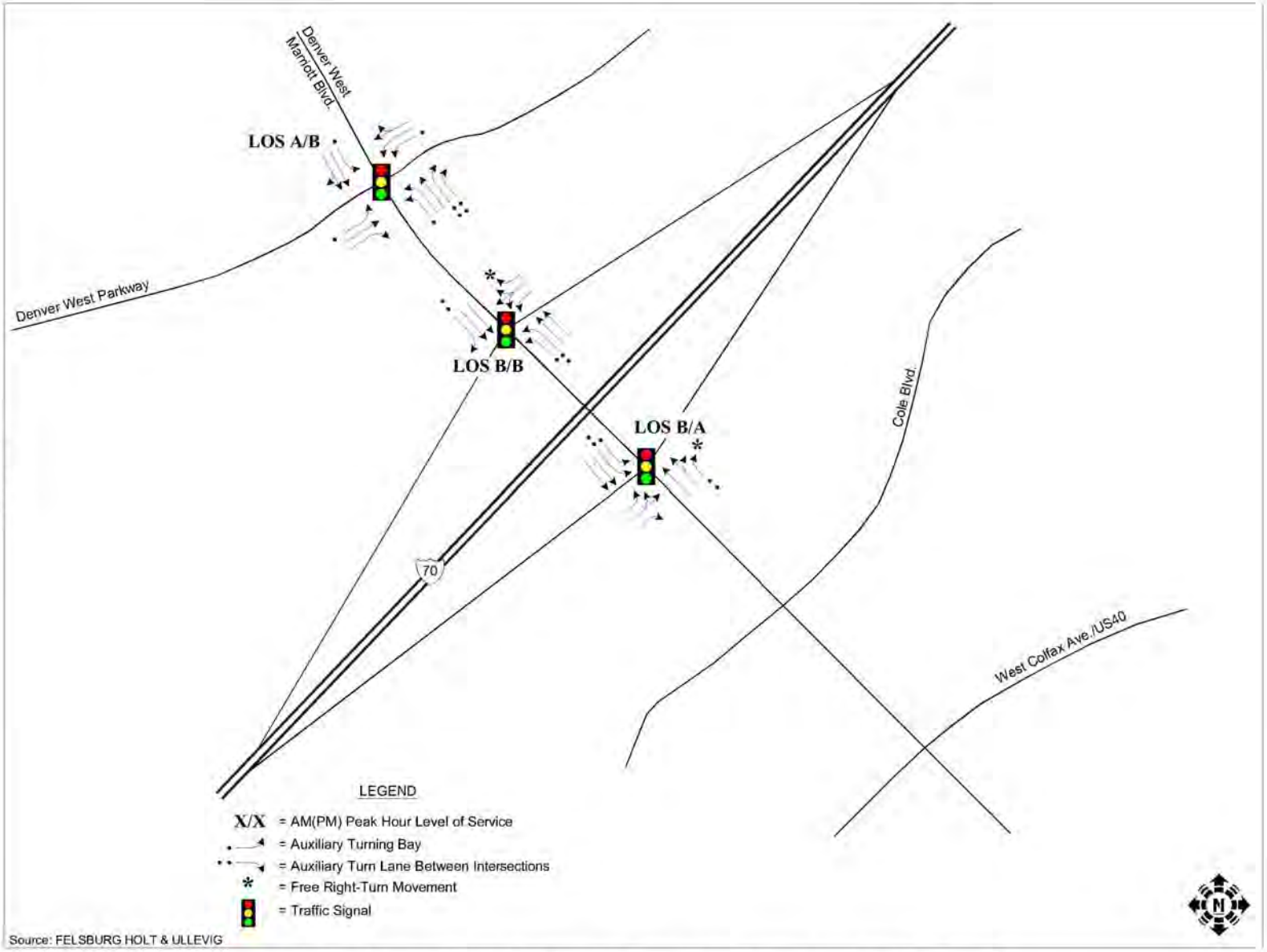


Figure 3-4 December 2002 Intersection Geometry and August 2002 Levels of Service

1. View of the Solar Energy Research Facility (SERF) located on the southeast slope of South Table Mountain. The High Flux Solar

2. View of the Visitors Center, SERF and the mesa top facilities looking northwest toward South Table Mountain (telephoto).

Figure 3-5. Photographs of the Site and Vicinity

3. View of a temporary dish system looking southeast.

4. Distant view of the subdivision on the northern side of Green Mountain from just west of the mesa top facilities.

Figure 3-5. Photographs of the Site and Vicinity

5. View from the Pleasant View neighborhood from a vantage point on the east side of the 25-acre Camp George West parcel looking northwest.

6. View from the Pleasant View Neighborhood from a vantage point on the west side of the 25-acre Camp George West parcel looking northeast.

Figure 3-5. Photographs of the Site and Vicinity

7. View of the undeveloped area east of the SERF and Visitor Center from the entry road to the STM site looking northwest.

8. View of STM Site from the condominiums at Camden Denver West looking west.

Figure 3-5. Photographs of the Site and Vicinity

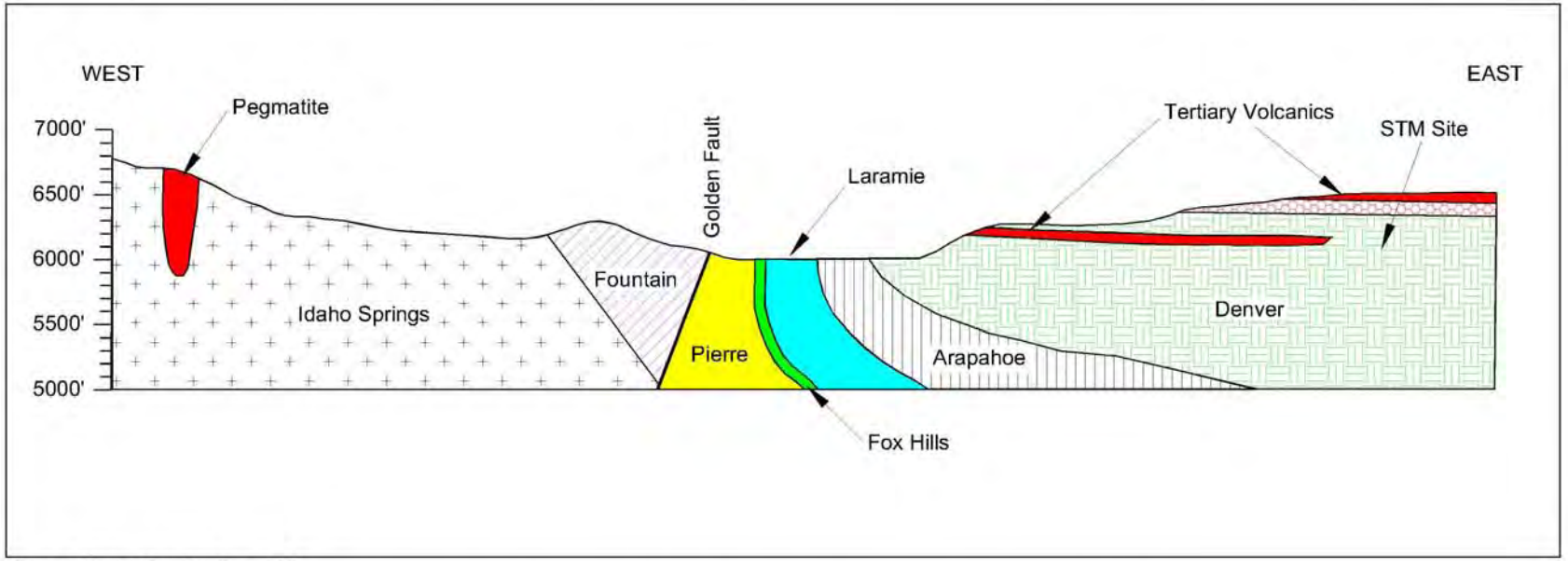
9. Panoramic view of southeast slope of South Table Mountain and surrounding areas. The Visitors Center and the SERF are located in the center and on the left, respectively. The Camden Denver West Condominiums and some of the buildings within the Denver West Office Park, including Building 27, are visible on the right (tan roofing) (telephoto).

Figure 3-5. Photographs of the Site and Vicinity

10. View of South Table Mountain from behind the "Estates at 6th Avenue" subdivision looking north.

11. View of the mesa top facilities, FTLB and SERF from the 6th Avenue frontage road (telephoto).

Figure 3-5. Photographs of the Site and Vicinity



Source: Adapted from Van Horn, 1976

Figure 3-6 Geologic Cross Section (West-East) Beneath the STM Site

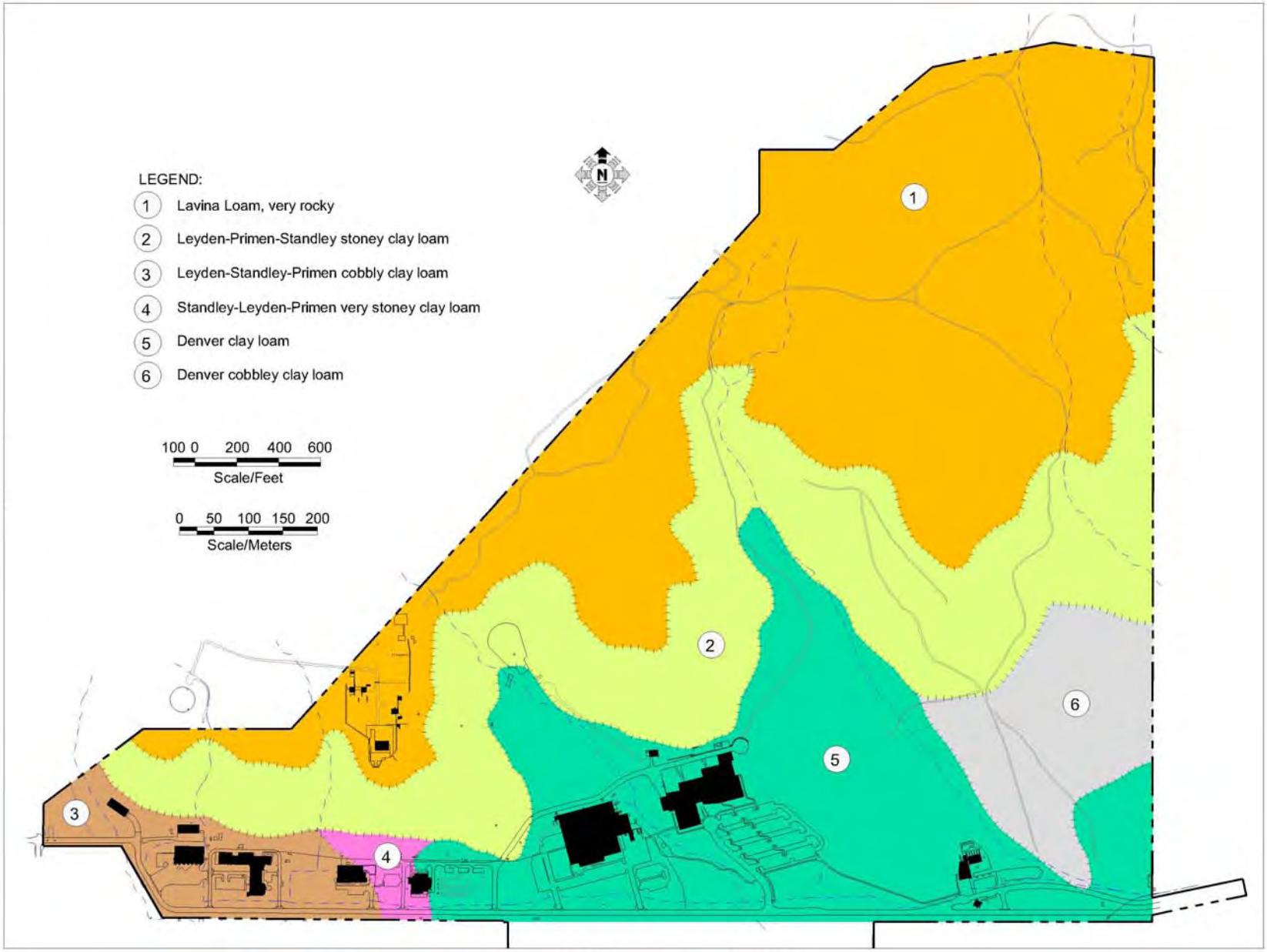
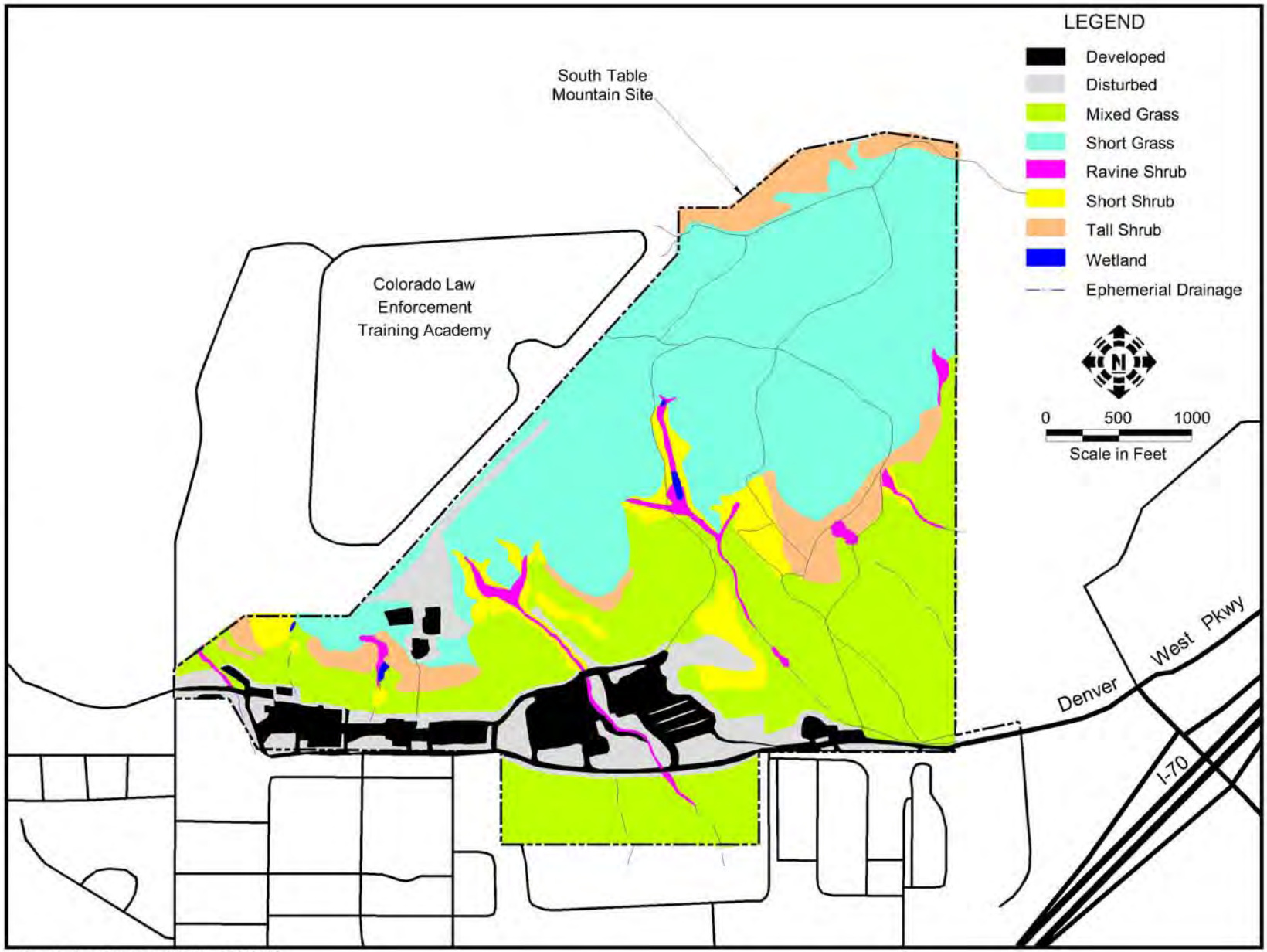


Figure 3-7 Soil Types at the STM Site



Vegetation Source: NREL, 08/02/02

Figure 3-8 Vegetation Map of the STM Site

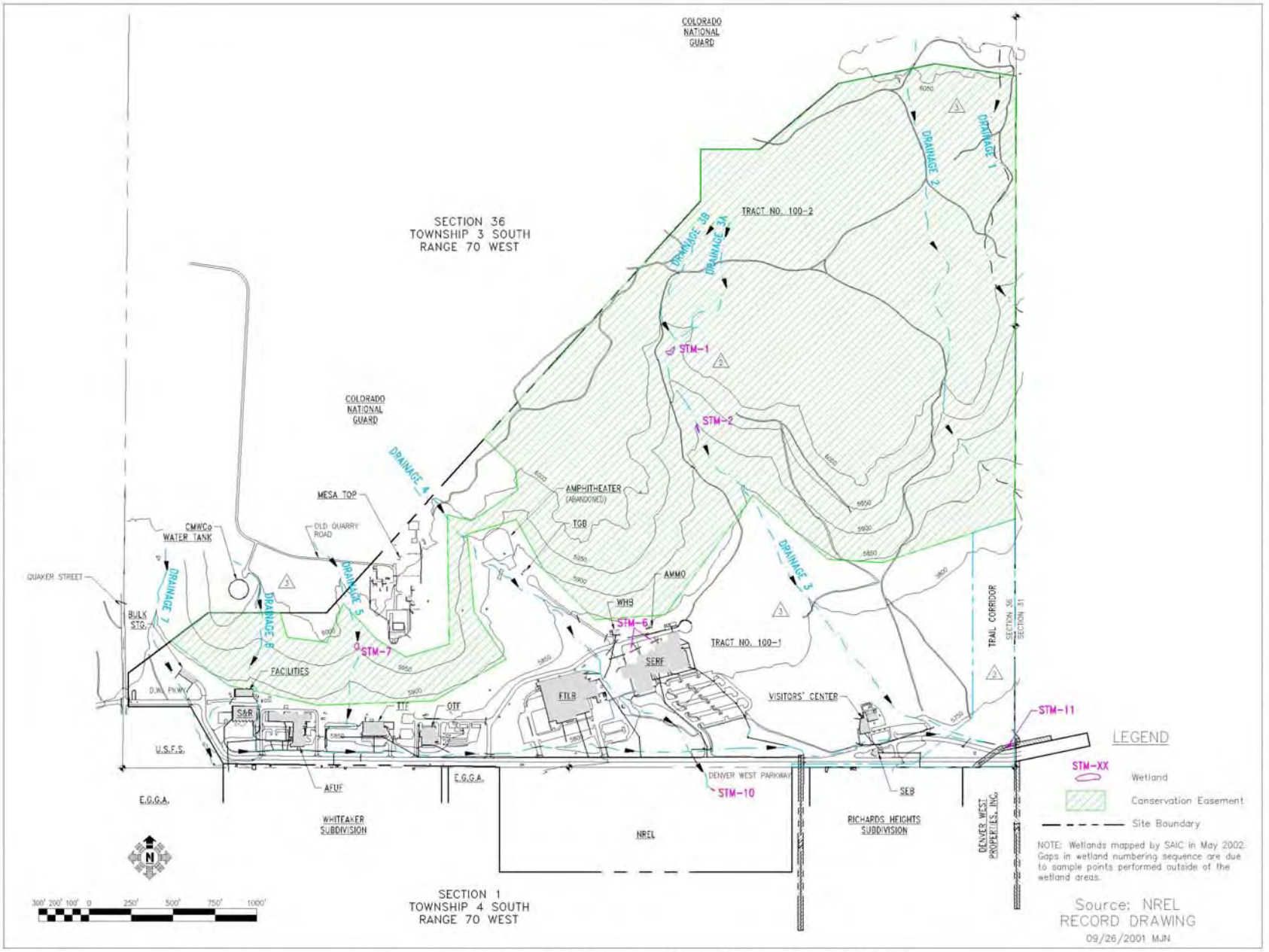


Figure 3-9 Potential Wetland Habitat Map of the STM Site

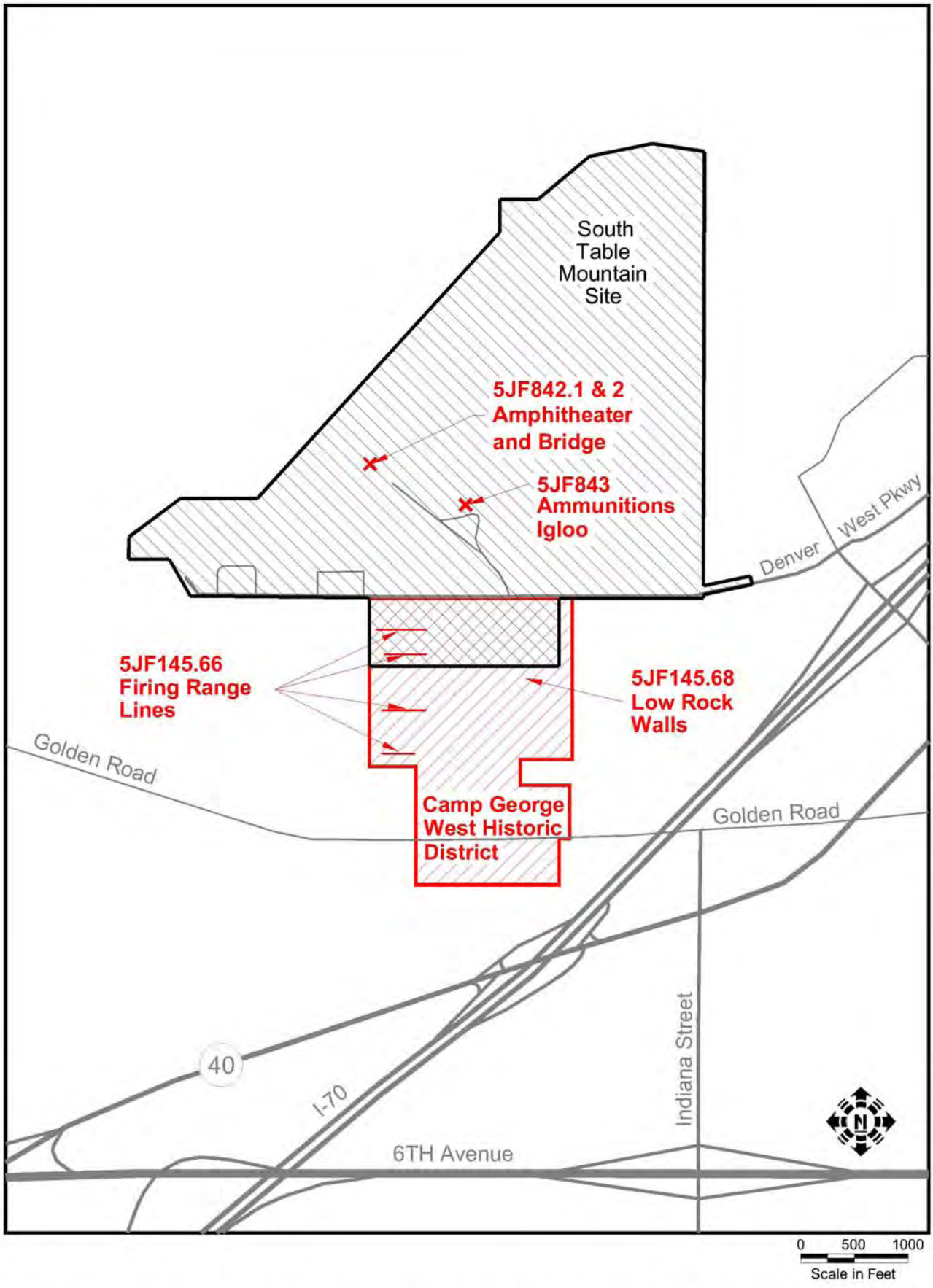


Figure 3-10 Historic District Boundaries and Locations of Historic Structures at the STM Site

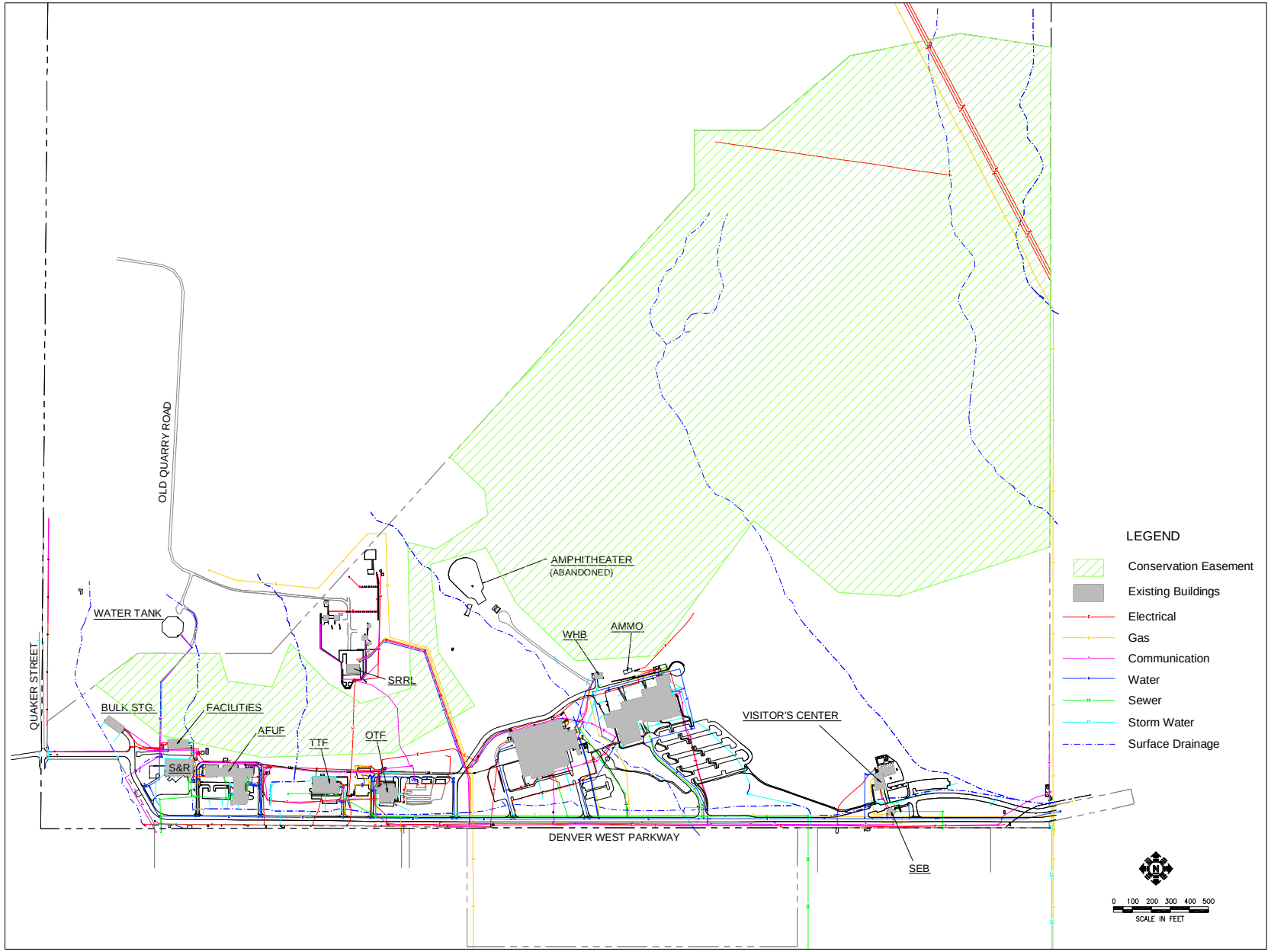
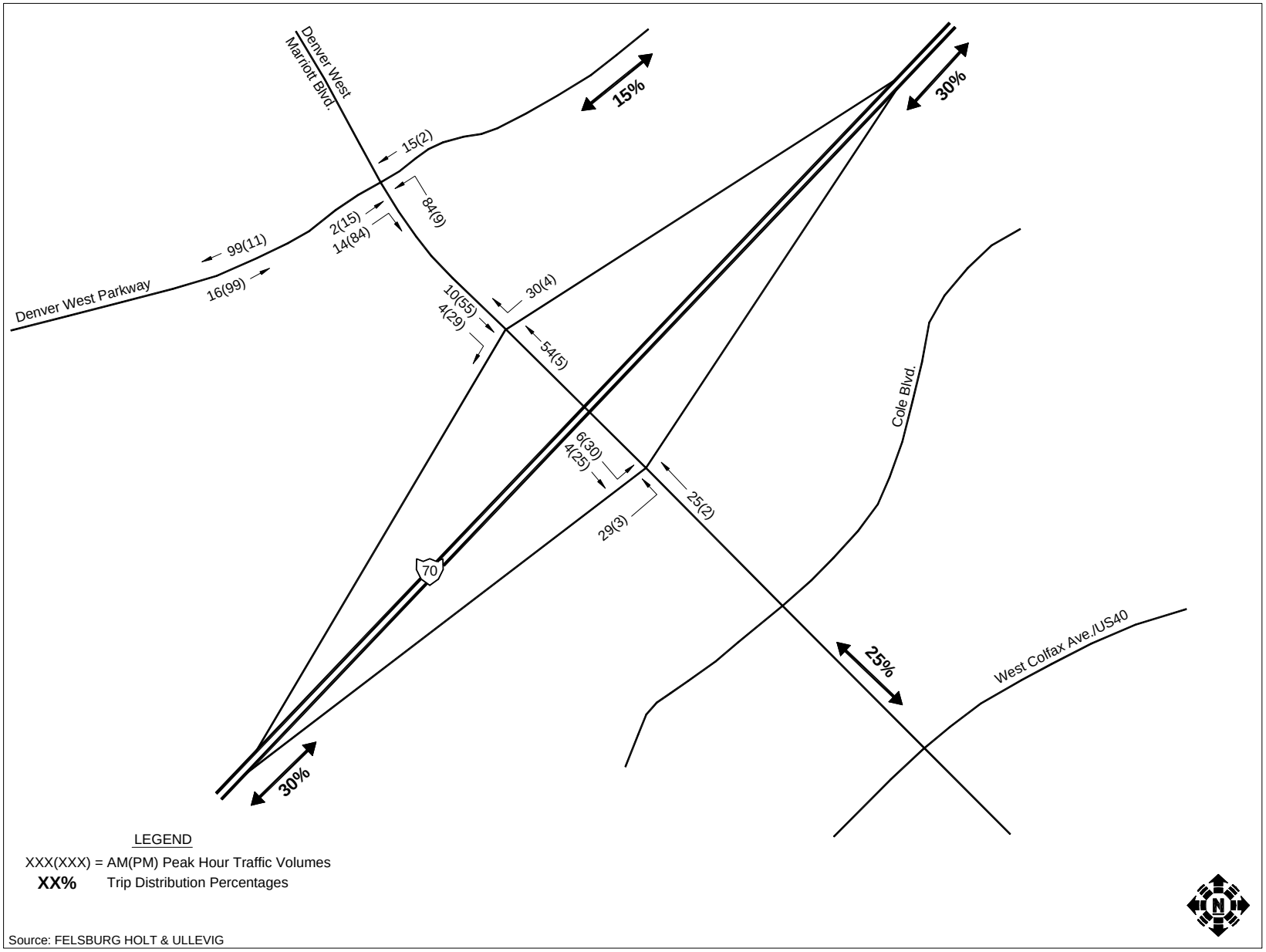


Figure 3-11 South Table Mountain Utilities Map



Source: FELSBURG HOLT & ULLEVIG

Figure 4-1 Project Generated Traffic Volumes (700 Employees)

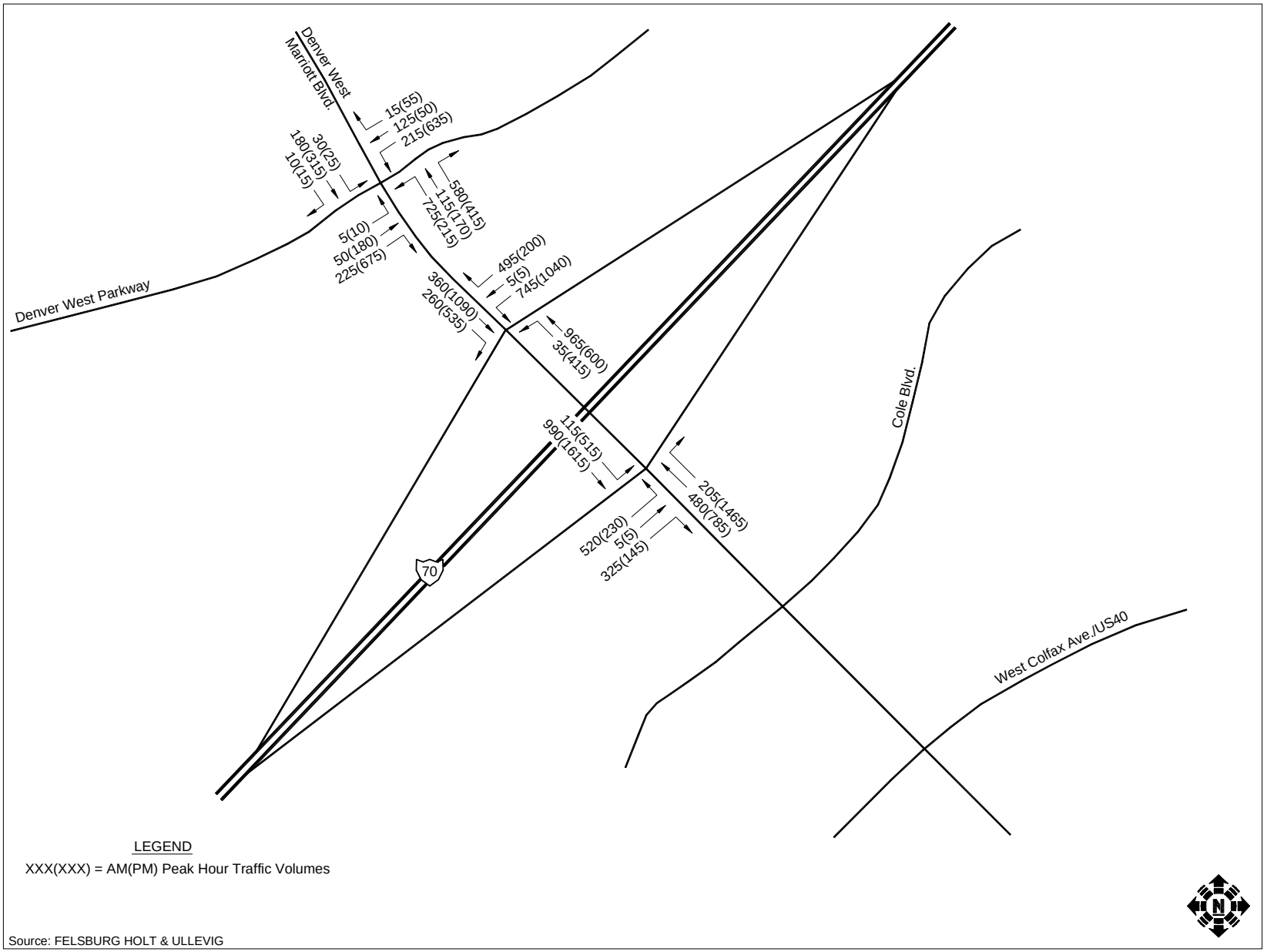
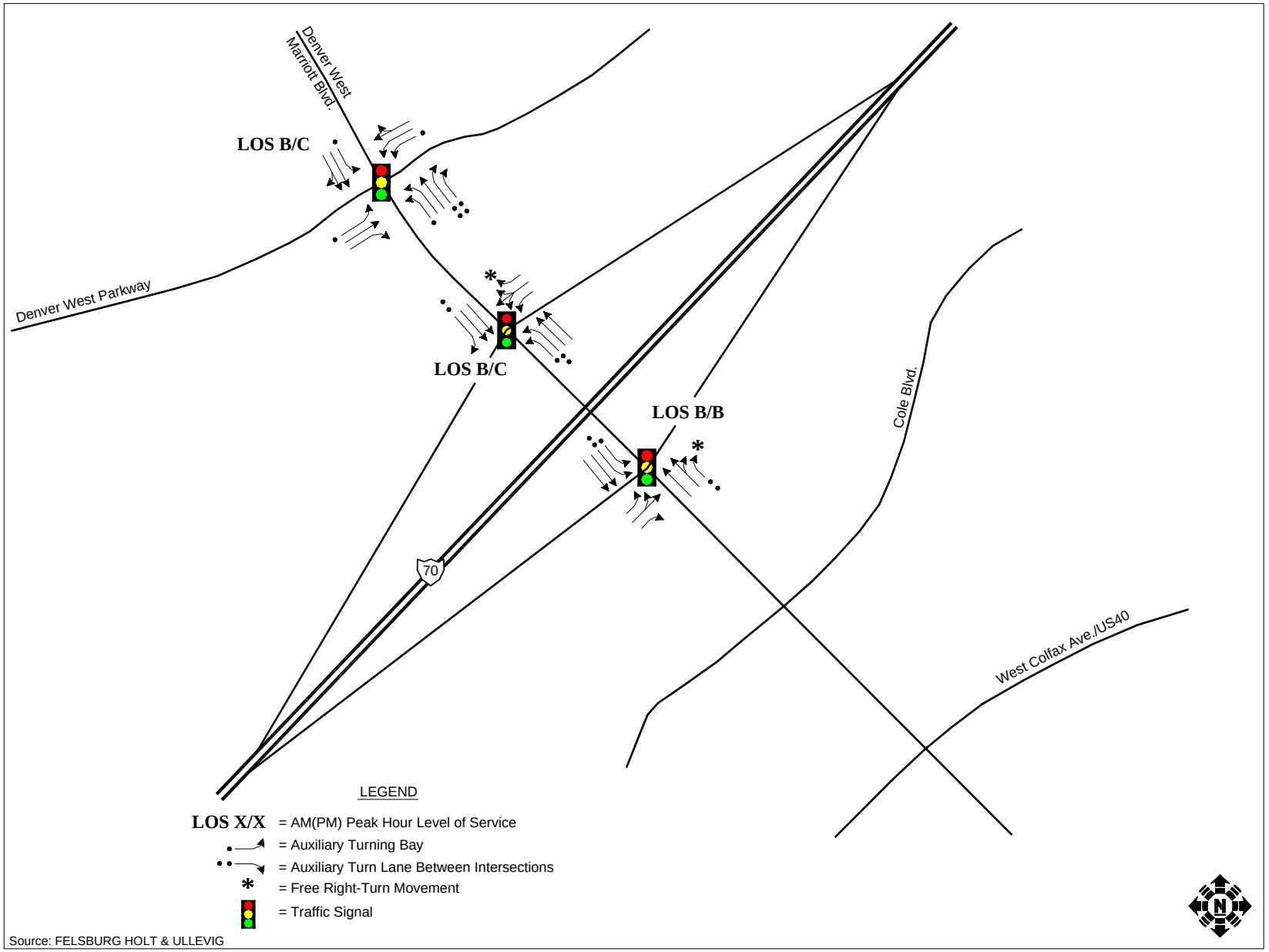
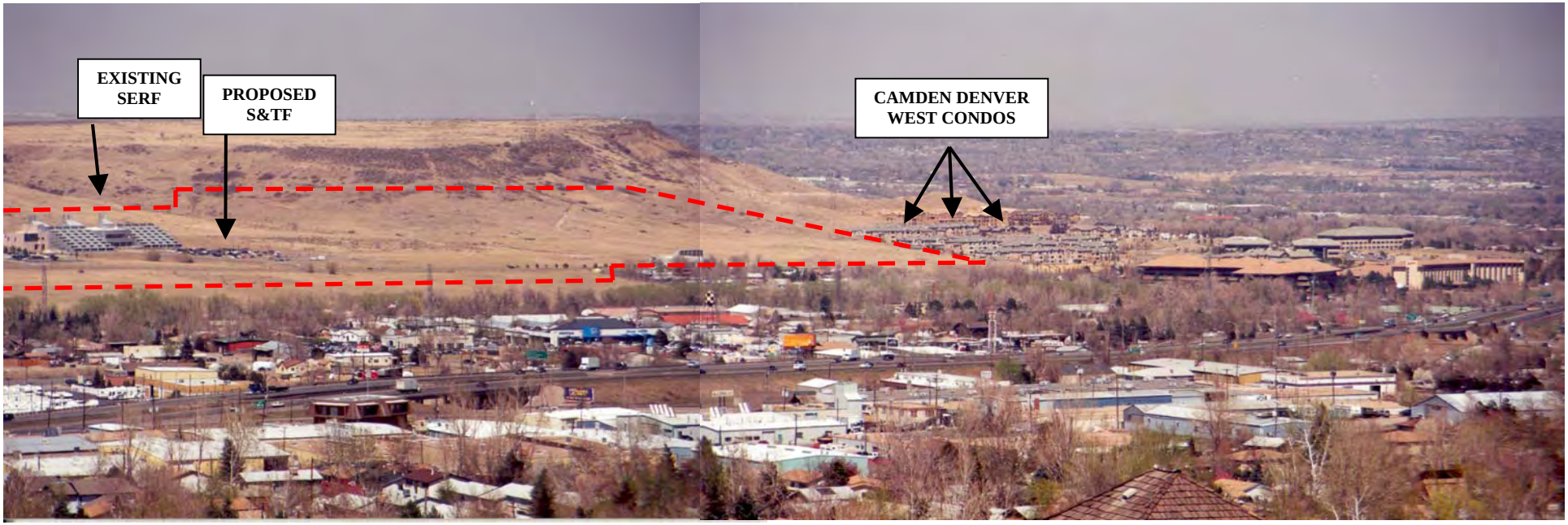


Figure 4-2 2022 Total Peak Hour Traffic Volumes with 700 New STM Workers



Source: FELSBURG HOLT & ULLEVIG

Figure 4-3 2022 Peak Hour Levels of Service with 700 Workers



1. NREL's expansion at the STM Site will include an additional building (S&TF) located directly east of the SERF and additional facilities between the S&TF and the Camden Denver West Condominiums and in other areas of the STM Site. The area outlined in red presents a rough approximation of the portions of STM Site that may be altered by new facilities as seen from this vantage point. Outlined areas are approximate.

Figure 4-4. Photographs of STM and DWOP Site and Long-Term Visual Impact Assessments

2. View of the STM Site from just south of Highway 6 (Sixth Avenue Service Road) looking north. The estimated future outline of long-term development is shown in red.

3. View of Zones 4 and 5 from the Camden Denver West Condominiums. The view looking west from adjacent units would be interrupted by new development in this area. Adjacent units would be interrupted by new development in this area.

Figure 4-4. Photographs of STM and DWOP Site and Long-Term Visual Impact Assessments

4. View of zones 4 and 5 from the north end of Kendrick Street looking north. The view from adjacent homes would be interrupted by new development in this area.

5. View of zone 6 from Moss Street looking southeast. The view from homes surrounding zone 6 and undeveloped land would be replaced with views of new NREL facilities.

Figure 4-4. Photographs of STM and DWOP Site and Long-Term Visual Impact Assessments

Figure 2. Local Setting Map, South Table Mountain Site