National Aeronautics and Space Administration

# Final Environmental Impact Statement for Proposed Demolition and Environmental Cleanup Activities at Santa Susana Field Laboratory

## *Ventura County, California*

*Prepared for*

George C. Marshall Space Flight Center
Huntsville, Alabama

*March 2014*

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# FINAL ENVIRONMENTAL IMPACT STATEMENT
# FOR THE PROPOSED DEMOLITION AND ENVIRONMENTAL CLEANUP ACTIVITIES
# AT SANTA SUSANA FIELD LABORATORY

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|---|---|
| LEAD AGENCY: | National Aeronautics and Space Administration |
| COOPERATING AGENCIES: | U.S. Fish and Wildlife Service<br>U.S. Army Corps of Engineers<br>California State Historic Preservation Office<br>Santa Ynez Band of Chumash Indians |
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| DATE: | March 2014 |

## ABSTRACT

This *Final Environmental Impact Statement for the Proposed Demolition and Environmental Cleanup Activities at Santa Susana Field Laboratory, Ventura County, California* has been prepared by the National Aeronautics and Space Administration (NASA) in accordance with the National Environmental Policy Act of 1969 (NEPA), as amended; the implementing regulations issued by the White House's Council on Environmental Quality (CEQ) (40 *Code of Federal Regulations* [CFR] Parts 1500-1508); the guidance letter submitted by CEQ dated June 19, 2012, and the NASA "Procedures for Implementing the National Environmental Policy Act (NEPA)" (14 CFR 1216.1 through 1216.3). This Environmental Impact Statement (EIS) presents an overview of the affected environment and the potential environmental consequences associated with proposed action and the no action alternative. It also informs NASA decision makers, regulating agencies, and the public of the potential environmental consequences of implementing the proposed demolition of SSFL site structures and the proposed groundwater and soil remediation.

NASA's Proposed Action is to demolish existing structures and to remediate groundwater and soil on the NASA-administered property of Santa Susana Field Laboratory (SSFL). Contamination is known to exist at NASA's SSFL property because of previous mission activities, and NASA has declared the property excess to its mission needs. The proposed action is needed to protect human health and the environment, to meet the environmental cleanup requirements agreed to with California Department of Toxic Substances Control, to reduce ongoing maintenance costs, and to prepare the property for disposition. The site contains structures eligible for National Register of Historic Places (NRHP) listing and NRHP listed archeological resources. NASA will use the EIS to comply with Section 106 of the National Historic Preservation Act (NHPA) in lieu of the procedures set forth in Sections 800.3 through 800.6 in accordance with Section 800.8(c) of the NHPA.

Overall, the environmental consequences of the proposed action are expected to be significant to biological, traffic, transportation, soil, and cultural resources. Impacts to air quality and greenhouse gas emissions, water resources, environmental justice, and health and safety resources are expected to be mostly moderate. Overall impacts related to groundwater cleanup are anticipated to be mostly negligible to minor with the exception of moderate impacts to groundwater hydrology.

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# Executive Summary

This *Final Environmental Impact Statement for Proposed Demolition and Environmental Cleanup Activities at Santa Susana Field Laboratory, Ventura County, California* has been prepared by the National Aeronautics and Space Administration (NASA) in accordance with National Environmental Policy Act of 1969, as amended (NEPA) (42 U.S.C. 4321 *et seq.)*; the Council on Environmental Quality Regulations for Implementing the Procedural Provisions of NEPA (40 *Code of Federal Regulations* [CFR] Parts 1500-1508); and NASA policies and procedures at 14 CFR subpart 1216.3. The purpose of this Final Environmental Impact Statement (EIS) is to assist in the decision-making process concerning demolition and cleanup activities for soil and groundwater at NASA's Santa Susana Field Laboratory (SSFL). This Executive Summary briefly describes the information contained within the EIS and its attachments.

## Background

SSFL is located on 2,850 acres of open, rocky terrain above California's Simi Valley in southeastern Ventura County, roughly 30 miles northwest of Los Angeles. The facility is divided into four Administrative Areas—Area I through IV—and two undeveloped areas. Area III, most of Area I, and the two undeveloped areas are owned and operated by The Boeing Company (Boeing). Area IV is owned and operated by Boeing for the U.S. Department of Energy (DOE), which has long held a lease on that land. Area II (409.5 acres) and a small portion of Area I (the Liquid Oxygen Plant Area, (41.7 acres) are owned by the United States (U.S.) government and administered by NASA.

Since 1948, site activities at SSFL included research, development, and testing of liquid-fueled rocket engines and components. From the 1950s through the early 1970s, Rocketdyne (one predecessor to Boeing) conducted operations in Areas I and III in support of various government space programs and in Area II on behalf of the U.S. Air Force (USAF), and then of NASA. NASA acquired its portion of the site in the 1970s from the USAF, who had been testing rocket engines at multiple test stands on the government portion of the site. NASA administers 451.2 acres in two areas (Areas I and II) of the SSFL. From the mid-1950s through the early 1980s, the U.S. Army, USAF, and NASA regularly conducted research, development, and testing of rocket engines in Area II (and early on, in Area I). Subsequent occasional testing occurred until 2006.

*Photo of a NASA Test Stand at SSFL (photo courtesy of NASA)*

In recent years as NASA's mission has evolved, there has been a transition in the kinds of launch systems needed, and testing for those systems is being undertaken at other NASA facilities. Following a lengthy period of consideration and review of its current and future needs, NASA has concluded it has no further need for this property located at SSFL. In September 2009, NASA submitted to the General Services Administration (GSA) a "report of excess" regarding the property administered by NASA at the Santa Susana Field Lab. GSA has conditionally accepted that report.

In August 2007, NASA, Boeing, DOE, and the Department of Toxic Substance Control (DTSC) signed a Consent Order for Corrective Action (State of California DTSC Docket No. P3-07/08-003, 2007) (2007 Consent Order) that addressed the cleanup of soils and groundwater at SSFL. In 2010, NASA and DTSC executed an Agreement in Principle for soil cleanup. Subsequently, on December 6, 2010, NASA and DTSC executed an Administrative Order on Consent (AOC) for Remedial Action (State of California DTSC Docket No. HAS-CO_10/11-038, 2010) that stipulates specific remedial requirements, including characterization and cleanup of soil contamination on the NASA-administered areas of SSFL in Ventura County, California.

# Proposed Action

NASA's Proposed Action for the purposes of the EIS is to demolish existing structures and to remediate groundwater and soil to meet the 2007 Consent Order and the AOC. These proposed activities will help NASA to meet its commitments under both orders and NASA's mission needs.

# NASA's Purpose and Need

The purpose of the Proposed Action is to remediate the environment to a level that meets NASA's environmental cleanup responsibilities and to undertake the demolition actions necessary to support both remediation and property disposition of the NASA-administered portion of SSFL.

Contamination is known to exist at NASA's SSFL property because of previous mission activities, and NASA has declared the property excess to its mission needs. Therefore, the Proposed Action is needed to protect human health and the environment, to meet the requirements of the 2007 Consent Order and the AOC by the completion date of 2017, to reduce ongoing maintenance costs, and to prepare the property for disposition.

# Overview

The EIS informs NASA decision makers, regulating agencies, and the public of the potential environmental consequences of implementing the proposed demolition of SSFL site structures and the proposed groundwater and soil remediation. NASA will use the EIS to comply with Section 106 of the National Historic Preservation Act (NHPA) in lieu of the procedures set forth in Sections 800.3 through 800.6 in accordance with Section 800.8(c) of the NHPA.

The timing of this EIS is intended to help NASA stay on track and meet the 2017 cleanup deadlines in the orders. This EIS evaluates only two alternatives: 1) the Proposed Action Alternative that provides for demolition of up to 100 percent of the structures, as well as soil and groundwater cleanup activities, allowing NASA to meet the requirements of the AOC and the 2007 Consent Order; and 2) the No Action Alternative. Table ES-1 will help orient the reader to the different sections of the EIS.

Overall, the EIS documents that the environmental consequences of the different elements of the proposed action can be significant. The proposed actions related to demolition would have a significant impact on cultural resources because of the demolition of historic districts. The soil cleanup activities necessary to meet the AOC would have significant impacts on cultural and biological resources, traffic and transportation, and soil resources. Impacts to air quality and greenhouse gas emissions, water resources, environmental justice, and health and safety from soil cleanup are expected to be mostly moderate. Overall impacts related to groundwater cleanup are anticipated to be mostly negligible to minor, with the exception of moderate impacts to groundwater and surface water hydrology and quality.

TABLE ES-1
**EIS Outline**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Summary Topic | Final EIS Sections | Information Provided |
|---|---|---|
| Origination and Summary | Pre-sections | Abstract<br>Executive Summary<br>Contents<br>List of Acronyms and Abbreviations |
| Future Needs and Challenges | Section 1 | Purpose and Need |
| Alternatives Evaluation Process | Section 2<br>Section 3<br>Section 4 | Description of Proposed Action and Alternatives<br>Affected Environment<br>Environmental Consequences |
| Coordination Opportunities | Section 5 | Agencies, Organizations, and Individuals Consulted |
| Minimizing Impacts | Section 6 | Mitigations and Monitoring |
| Reference Information | Section 7<br>Section 8<br>Section 9<br>Section 10 | List of Preparers<br>Glossary<br>Index<br>References |
| Supporting Information | Appendices A, B, H, I, J<br>Appendix C<br>Appendix D, E, F<br>Appendix G<br>Appendix L<br>Appendix K | Supporting Information, Analysis, and Correspondence<br>Cultural Surveys Summary<br>Biological Surveys<br>Wetlands Delineation<br>Agency Consultation Coordination<br>Public Comments and NASA Responses (Scoping and Draft EIS) |

# Public Involvement in Developing the EIS

## EIS Scoping

The Notice of Intent to prepare an EIS was published in the *Federal Register* (FR) on July 6, 2011 (76 FR 39443-39444), inviting agencies, organizations, tribal governments, individuals, and interested parties to participate in developing the scope and identifying environmental issues for the EIS. NASA also provided notifications in the newspapers *The Daily News*, *Simi Valley Acorn*, *Ventura County Star*, and *La Opinion*, and announced public scoping meetings. NASA accepted written and verbal comments at public scoping meetings and throughout the extended 74-day scoping period (July 8 through September 19, 2011). NASA hosted public meetings (August 16, 17, and 18, 2011) at which the public was invited to speak, and 55 oral submittals were transcribed by a court reporter. Technical experts were available for questions and discussion during a poster session followed by NASA's presentation and Question and Answer session.

Two hundred thirty-one submittals from agencies, organizations, and individuals were received by e-mail, U.S. postage, or hand delivery at the meetings. Because many submittals contained multiple comments, a total of 756 comments were identified. The majority of comments may be grouped in four general areas:

- Retain or limit the range of alternatives
- Preserve the valuable natural, historical, and cultural resources at SSFL

- Address transportation routes and effects of potentially increased traffic
- Consider multiple cleanup technologies

NASA also held a Community Informational Update on the EIS on March 27, 2012, to describe the areas for remediation and the technical approaches being considered to achieve soil and groundwater cleanup.

## Informational Meeting

An informational meeting was held on March 27, 2012, to present an EIS update to the public. The topics presented were an overview of the EIS process, how impacts are assessed, and potential remediation technologies. Following the presentations, questions were answered. Displays of technical information also were available for the public to view and ask questions about. No comments for the record were accepted at this meeting, because it was informational in nature and served to prepare the public for the upcoming Draft EIS. Notice of the date and time for the meeting was posted on the NASA website, distributed by tweet and to the email distribution list, and mailed to the neighbors with addresses on Woolsey Canyon Road.

## Public Comments on the Draft EIS

NASA published its request for comments on the Draft EIS (DEIS) on August 2, 2013, with a 45-day deadline to submit comments, as required by NEPA. At the request of the public, NASA added an additional 15 days to the public review period for a 60-day deadline to review the DEIS. Because of the government shutdown that occurred on day 60 of the public comment period, NASA accepted any comments received during this time up through October 17, 2013. NASA received 2,185 individual submittals of comments on the DEIS, which contained 4,164 separate comments. In general, comments could be classified into two groups. The first group is those that support the AOC and urged NASA to move forward with the cleanup. The second group is those who either did not support the AOC and do support health risk-based cleanup, or who wanted to ensure that in carrying out cleanup to meet the AOC, the impacts to the community and the environment are minimized or avoided.

NASA reviewed each comment and has provided responses to the individual comments in Appendix K. The Appendix K document identifies the person who submitted the comment, the comment as it was extracted from the submittal, and NASA's response to the comment. Some responses refer to specific sections in the EIS where answers can be found to the comments or questions, some indicate that information was added or updated to reflect the comment, others were comments on topics that were outside the scope of the EIS, some responses answer questions or comments directly, and some simply acknowledge the statement made in the comment. Copies of individuals comments are located on the NASA Freedom of Information Act website at (http://foia.msfc.nasa.gov/docs/SSFL/index.html).

Specifically, 2,622 of the comments were similar form letters or similar in content and supported NASA's commitment to the AOC. Some stated that they "were pleased that the AOC provides sufficient protection for endangered species and Native American artifacts," referring to the exceptions clauses of the Agreement in Principle attached to the AOC. Others voiced concerns that the way NASA presented the impacts was distracting from the overall AOC goal.

Of the remaining comments (1,542), at least 30 comments focused on the 2017 deadline as being "artificial" or a concern that is influencing the way the cleanup can be achieved. More than 140 were concerned about biological resources and another 95 focused on transportation issues (such as the number of trucks driving through communities). In the mix were comments about the future use of the site, which is not covered by this EIS. More than 350 comments were concerned with the limited alternatives considered in the EIS. A little more than 430 comments expressed concerns regarding cultural resources or historic properties. Additionally, a number of the comments on cultural resources indicated that more archeological surveys should be conducted. Some commenters mentioned that the EIS was premature, as NASA still has to complete its final soil and groundwater field sampling and treatability feasibility studies it is conducting with DOE and Boeing. Some also recommended that the EIS should be deferred to accommodate DTSC's California Environmental Quality Act process.

## Agency Comments on the Draft EIS

Comments were received by multiple federal, state, and local agencies, including but not limited to, the U.S. Department of the Interior (DOI), U.S. Environmental Protection Agency (EPA), Advisory Council on Historic Preservation, California Office of Historic Preservation, and California Department of Fish and Wildlife; and the Santa Ynez Band of Chumash Indians and other federally recognized tribes. A few of the agency comments are summarized in the following paragraphs. Copies of the agency comments and responses to them are located in Appendix K.

The EPA provided a letter with several concerns regarding the information provided in the EIS. The EPA rated the DEIS as Environmental Concerns – Insufficient Information (EC-2), recommending that NASA offer a specific preferred treatment option for soil removal and groundwater cleanup. EPA's letter also noted that "If NASA determines that any part of the federal land is a Sacred Site or Traditional Cultural Property, we also encourage you work proactively with California Department of Toxic Substance Control and tribal representatives to mitigate project impacts."

DOI comments focused on concerns regarding the proposed action on historic structures, archeological sites, and important wildlife linkages.

The letter from the Santa Ynez Tribe noted concerns about "significant unmitigated impacts to Sacred Sites and cultural resources" including "avoidance of adverse physical effects in accordance with E.O. 13007." The Santa Ynez also requested additional investigations, including "subsurface archeological testing in areas scheduled for any excavation." Their submission noted that "To the extent feasible, NASA should exhaust all nonexcavation methods of remediation before performing any excavation that could potentially impact cultural and historic sites." The letter also requested that the entire southern half of NASA's Area II be protected, including the removal of the Coca Historic District and test stands. Included in their requests for consideration of new mitigation was a Cultural Interpretive Center.

The Ventura County Air Pollution Control District provided input regarding proposed use of equipment and trucks that would cause emissions, noting that air monitoring programs and permits might be required for certain remediation technologies.

The County of Ventura Resource Management Agency (VCRMA) provided guidance regarding diversion of uncontaminated waste from waste streams for recycling, roads, and concern for evaluation of impacts on biological resources and native soils. The comments from VCRMA mentioned concerns with proposed mitigation measures for biological resources and provided suggested revisions such as preconstruction surveys for wildlife. VCRMA raised concerns that the proposed clearing of vegetation and soil to achieve cleanup goals "is not consistent with the County's goals of preserving natural resources" and expressed concern that the site would not be returned to its "natural state . . . given NASA's plan to remove such large amounts of soil and vegetation." The Planning Division with VCRMA expressed concerns that "without an analysis of . . . reasonably anticipated future land use" it is difficult to conclude that remediation decisions are, indeed, consistent with existing and/or future land uses. The submission also included numerous comments on resolution of adverse effects on historic properties, traditional cultural properties, and Indian Sacred Sites.

## Consultation under Section 106 of the National Historic Preservation Act

The NHPA requires NASA to consult with federal, state, and local agencies, Native American Tribes, other organizations, and members of the public having a potential interest in the Proposed Action. NASA posted on its website a form for interested parties to request participation in the Section 106 consultation process under NHPA regulations 36 CFR 800. More than 35 individuals have been involved during the consultation, with additional parties having joined as recently as November 2013. Consulting parties have varying interests in the site and include representatives from federally recognized tribes and members of state-recognized tribes. Consulting parties have met onsite at SSFL and via teleconference to discuss the potential impacts to historic properties such as the Burro Flats Cave and the historic test stand districts. Consultation will culminate with measures to address the adverse effects to historic properties stipulated in the Record of Decision (ROD) and possibly a Programmatic Agreement, which completes the EIS process and will complete the Section 106 process. The ROD is the formal document that states NASA's decision, identifies the alternatives considered, and discusses mitigation plans, commitments by the agency, and monitoring.

## Selection of Alternatives to Evaluate

NASA originally proposed to evaluate a range of alternatives including the "cleanup to background" alternative required by the AOC, the No Action Alternative required by NEPA, and other alternatives that are consistent with those evaluated under a Superfund or Resource Conservation and Recovery Act cleanup process that considers the level of risk that needs to be mitigated to allow the site to be safe for different potential future uses. Subsequently, NASA received comments from Senator Barbara Boxer's office and the White House Council on Environmental Quality (CEQ) regarding the relevance of including alternatives other than cleanup to background under the AOC. In a letter to Senator Boxer, Nancy H. Sutley, Chair of CEQ noted:

> *CEQ encourages agencies to carry out robust alternatives analyses that consider all reasonable alternatives, including those that are not within agencies' authorities. The real focus, however, must always be on a meaningful consideration of alternatives. In this particular situation, where NASA has signed the Agreement and committed to a cleanup standard to background, nothing under NEPA or CEQ regulations constrains NASA from looking beyond cleanup to background, even though some may consider the analysis unnecessary and inconsistent with the agreement NASA signed with the State. However, there is no requirement that NASA consider alternatives that cleanup to standards that differ from the agreement with the State. The Supreme Court has stated that the concept of alternatives must be bounded by some notion of feasibility, Vermont Yankee Nuclear Power Corp. v. NRDC, 435 U.S. 519, 551 (1978) and under the specific facts of the cleanup at this time, feasibility is most sufficiently defined within the scope of cleanup to background. There would, of course, have to be a no-action alternative considered.*

The letter later states:

> *In view of NASA's administrative cleanup resolution with the State of California, which turns upon NASA's commitment to clean the site to local background levels, CEQ's view is that – under this rule of reason – NASA is not compelled to consider less comprehensive cleanup measures as alternatives.*

With this direction, NASA issued the following statement:

> *We received comments from Senator Boxer and the Council on Environmental Quality regarding the evaluation of alternatives for the preparation of our Environmental Impact Statement. As a result, NASA has chosen to streamline its review in the Draft Environmental Impact Statement (DEIS) and analyze only the alternatives of (a) cleanup to background and (b) the no-action alternative.*

NASA's decision was published on NASA's website at http://ssfl.msfc.nasa.gov/environmental-cleanup/environmental-impact-statement/. Numerous letters from interested parties were received requesting NASA reconsider its decision to limit alternatives. Among them is a legal memorandum prepared for the Santa Ynez that questions the legality of limiting the scope of an EIS to only a Proposed Action and a No Action Alternative. It also states, "The administrative order NASA consented to prior to NEPA analysis is invalid for failure to first prepare an EIS – and is not binding on NASA, a federal agency, under the Supremacy Clause of the Constitution." Additionally, some comments received during the public comment period mirrored this concern.

Although many comments were received requesting NASA include multiple alternatives for the analysis, NASA recognizes that even if the alternatives were included they would not meet the requirements of the AOC. While an EIS is intended to support full disclosure of the impacts associated with an agency-proposed action or decision, NASA was compelled to recognize that the scope of its decision regarding cleanup of SSFL is limited by the AOC. In addition to the Proposed Action and No Action Alternatives, this EIS evaluates various technical options for both soil and groundwater cleanups. These different methods and technologies (used separately or in combination) were evaluated for their impacts on the environment and their effectiveness in meeting the AOC (for soil cleanup) and 2007 Consent Order (for groundwater cleanup). These were evaluated in accordance with relevant federal, state, and local regulations.

## Alternatives Evaluated

### Demolition, Soil Cleanup to Background Levels, and Groundwater Cleanup

#### Proposed Demolition Activities

The Proposed Action assumes demolition of up to all existing structures on NASA-administered property, which provides the most conservative assessment (worst-case scenario) of impacts. Dismantled components would be contained, as appropriate, and transported for offsite recycling or disposal. The structures include Alfa, Bravo, and Coca Test Stands and inactive ancillary structures that could include the following:

- Aboveground and subsurface structures
- Building foundations
- Utility poles
- Piping
- Administrative and operations buildings
- Water tanks
- Aboveground and belowground storage tanks
- Observation lookouts, roadways, and drainageways

With the completion of the EIS, NASA could be ready to begin demolition in 2014 and complete the majority of demolition in 2015 ahead of the proposed soil and groundwater cleanup activities.

#### Proposed Soil Cleanup Activities

The AOC requires that NASA remediate the soils to Look-Up Table values provided by DTSC. These values were developed using local background values and laboratory method reporting limits. Viable cleanup technologies were identified based on their effectiveness to clean up the specific contaminants at the site under the environmental conditions at SSFL. For purposes of evaluation, the contamination can be separated into two groups of soils: treatable and non-treatable soils.

***Treatable*** soils may contain polycyclic aromatic hydrocarbons, semivolatile organic compounds (SVOCs), total petroleum hydrocarbons, and volatile organic compounds (VOCs). These soils have the potential of being cleaned to AOC standards using technologies discussed later in this document. The ability of any technology to meet the AOC requirements must still be demonstrated. NASA is currently conducting treatability studies to evaluate the feasibility of some of the technologies included in this analysis. As of writing this EIS, excavation and offsite disposal is the only proven remedial technology to meet AOC standards.

***Non-treatable*** soils may contain dioxins, polychlorinated biphenyls, metals, pesticides, and energetics. While some technologies might be able to treat some of the constituents in a class, (one type of metal in the class of all metals, for example), even if one in the class is not able to be treated, then the class is considered non-treatable. Mixed soil is considered a co-location of treatable and non-treatable soils that would require some excavation and some potential use of treatment technologies.

In the vast majority of contaminated areas on NASA-administered land at SSFL, the top 2 feet (ft) of soil contain non-treatable chemicals and cannot be remediated using any of the technologies. The only way to get the non-treatable chemicals to background levels (AOC requirements) is by excavating and disposing the soil—an estimated 320,000 cubic yards ($yd^3$)—offsite.

#### Excavation and Offsite Disposal

The EIS provides a comparative analysis of the excavation and offsite disposal of both the minimal anticipated excavation amount of about 320,000 $yd^3$ (assuming treatment technologies are proven effective) and the maximum anticipated excavation amount of about 500,000 $yd^3$ (assuming the treatment technologies are not effective).

**Potential Soil Treatment Technologies**

The EIS provides a comparative analysis of the potential impacts from the other technologies that might be used separately or in combination to remediate the treatable soils underneath (after excavation). These technologies include the following:

- Soil vapor extraction (SVE)
- Ex situ treatment using land farming
- Ex situ treatment using thermal desorption
- Ex situ and in situ chemical oxidation
- In situ anaerobic or aerobic biological treatment

**Proposed Groundwater Cleanup Activities**

Groundwater would be cleaned up consistent with a risk-based protocol required by the 2007 Consent Order. Viable remediation technologies were identified based on their effectiveness to clean up the specific contaminants at the site. The EIS provides a comparative analysis of the potential effects from the following technologies used separately or in combination:

- Pump and treat
- Vacuum extraction
- Heat-driven extraction
- In situ chemical oxidation
- In situ enhanced bioremediation
- Monitored natural attenuation
- Institutional controls

# No Action Alternative

The No Action Alternative considers a continuation of current activities, with no other action as described and evaluated in this EIS. NASA would not demolish test stands or ancillary structures on the NASA-administered property of SSFL, and would not conduct monitoring of test stands. NASA would not conduct soil remediation at the site or groundwater treatment beyond the groundwater extraction and treatment system and interim source removal action (ISRA) activities currently underway. Ongoing groundwater and surface water sampling on the site would continue. Once those remedial programs were concluded, no further remedial action would occur. Contaminants not captured by those programs would remain in place or attenuate naturally over time.

# How the EIS Was Conducted

NASA identified specific activities involved in implementing the Proposed Action, then evaluated how much of an impact the activities would have on the environment. For the EIS, impacts were analyzed by environmental resource areas that make up the natural and human environment and include physical, social, and cultural issues that could affect or be affected by the Proposed Action. NASA identified 11 major environmental resource areas of cultural resources; biological resources; air quality; water resources; hazardous and nonhazardous materials; traffic and transportation; soils, landslide potential, topography and paleontological resources; health and safety; site infrastructure and utilities; noise; and environmental justice.

For each of the 11 environmental resource areas, a region of influence (ROI) was identified that includes the entire vicinity surrounding the resource area that could be affected. The EIS evaluated how much of an impact there would be in each resource area in the appropriate ROI for the Proposed Action and the No Action Alternative. The evaluation involved examining the types and intensities of the potential impacts. It considered, for example, whether impacts would be local to the SSFL site or have wider, more regional impacts. It looked at whether impacts would be short term, occurring only during site work, or long term, lasting after the work was complete. Table ES-2 lists the evaluation criteria for analyzing potential impacts and an impact's level of significance.

TABLE ES-2
**Evaluation Criteria for Analyzing Environmental Impacts**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| | **Intensity of Impact** |
|---|---|
| **No Impact** | No impacts would be expected |
| **Negligible** | Impacts would not be expected to be measurable, or would be measurable but too small to cause any change in the environment |
| **Minor** | Impacts would be measurable but within the capacity of the affected system to absorb the change |
| **Moderate** | Impacts would be measurable but within the capacity of the affected system to absorb the change and the impacts could be compensated for with mitigation and resources, so the impact would not be substantial |
| **Significant** | Impacts would be measurable but not within the capacity of the affected system to absorb the change, and without major mitigation could be severe and long lasting |
| | **Type of Impact** |
| **Beneficial** | Would result in some level of environmental improvement |
| **Negative** | Would have an adverse effect on the natural or human environmental to include physical, social, or cultural environment |
| | **Context of Impact** |
| **Local** | Would occur within the NASA-administered property at SSFL |
| **Regional** | Would occur outside the NASA-administered property at SSFL |
| | **Duration of Impact (How Long)** |
| **Short term** | Would occur only during the proposed demolition and immediate remediation period |
| **Long Term** | Would continue beyond the proposed demolition and immediate remediation period |

## Summary of Environmental Consequences

In each resource area, a number of items were considered and evaluated. The highest level of intensity (negligible, minor, moderate, significant) for any of the individual items evaluated in a resource area determines that resource area's overall impact. For example, if the intensity of one impact within a resource area was identified as significant, then that resource area was considered to have an overall significant impact. Table ES-3 summarizes the results of the Proposed Action impact analysis for each resource area. Each impact summarized in the Executive Summary has a unique identification so that it readily can be recognized in the body of the EIS and in tables referenced in the EIS. The unique identification consists of the resource area name followed by a numeric or alphanumeric character. For example, if a potential impact is identified for traffic, it would be identified as ***Traffic Impact-1*** and subsequent potential traffic impacts would have a different number or alphanumeric character associated with the impact.

TABLE ES-3
**Summary of Impacts for the Proposed Demolition and Environmental Cleanup at NASA's Santa Susana Field Laboratory**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Significant Impacts | Moderate Impacts | Minor or Negligible Impacts | Beneficial Impacts |
|---|---|---|---|
| – Soils, Landslide Potential, Topography, and Paleontological Resources<br>– Cultural Resources<br>– Biological Resources<br>– Traffic and Transportation | – Water Resources<br>– Air Quality and Greenhouse Gas Emissions<br>– Environmental Justice<br>– Health and Safety | – Site Infrastructure and Utilities<br>– Noise<br>– Hazardous and Nonhazardous Materials and Waste | – Biology<br>– Surface Water<br>– Health and Safety |

# Summary of Impacts for Demolition

## Significant Impacts

### Cultural Resources

Cultural resources include architectural and archeological resources, traditional cultural properties, cultural landscapes, and Indian Sacred Sites. The Proposed Action calls for the demolition of historic structures on NASA-administered land at SSFL. Demolition would have a ***significant, negative, regional,*** and ***long-term*** impact to historic architectural resources. Historic architectural resources are the Alfa, Bravo, and Coca Test Area Historic Districts. These include 45 structures total, of which 9 are individually eligible for listing in the National Register of Historic Places (NRHP) and 36 are eligible as contributing resources to the historic districts. Up to 100 percent of these historic structures would be demolished.

### Biological Resources

Impacts to biological resources were analyzed based on field surveys (2010 and 2011), other SSFL studies, readily available resource data, literature reviews, ongoing regulatory discussions, and professional opinion. The criteria for evaluating biological resources in the EIS include disturbance, displacement, and mortality of plant and wildlife species and destruction of sensitive habitat. The structures to be demolished and staging areas for demolition equipment are in already developed areas. Migratory birds and sensitive wildlife species have been observed nesting on test stands, transformer poles, and other structures. These wildlife species would be expected to vacate the area during demolition and possibly would return when demolition ends. Specific impacts to USFWS- and CDFW-listed species from the cleanup efforts are identified in Section 4.4.1.1. If a species listed as threatened of endangered by the USFWS was harmed during demolition, it would be a ***significant, negative, regional, and long-term*** impact (***Biology Impact-1f***).

### Traffic and Transportation

It was estimated that 3,660 truckloads of demolition debris (for 100 percent demolition) would be transported offsite. The truck route from the site would use Woolsey Canyon Road to Valley Circle Boulevard to Roscoe Boulevard to Topanga Canyon Boulevard. Because of the heavy vehicle trips during demolition, some degradation of Roscoe Boulevard, Valley Circle Boulevard, and Woolsey Canyon Road would be expected. Within the project site, Service Area Road also might undergo similar degradation. In some locations, this degradation could result in deteriorated pavement, which could affect comfort and pavement life. This pavement deterioration would result in a ***significant, negative, regional,*** and ***long-term*** impact to local pavement conditions of City of Los Angeles or Los Angeles County roadways (Roscoe Boulevard, Valley Circle Boulevard, and Woolsey Canyon Road) leading to SSFL.

## Moderate, Minor, and Negligible Impacts

### Soils, Landslide Potential, Topography, and Paleontological Resources

The primary impact to soils from demolition would be erosion and there would be a ***moderate, negative, regional***, and ***short-term*** impact. Demolition might temporarily increase landslide potential by loosening the soil around the structures to be demolished, having a ***minor, negative, local***, and ***short-term*** impact. Removing underground components of structures to be demolished would potentially affect the topography of the NASA-administered property, although this activity would primarily be surficial and would have a ***negligible*** to ***minor, negative, local,*** and ***long-term*** impact. Demolition would not be expected to affect surrounding soils, and therefore, would not impact paleontological resources.

### Biological Resources

Impacts to biological resources were analyzed based on field surveys (2010 and 2011), other SSFL studies, readily available resource data, literature reviews, ongoing regulatory discussions, and professional opinion. The criteria for evaluating biological resources in the EIS include disturbance, displacement, and mortality of plant and wildlife species and destruction of sensitive habitat. The structures to be demolished and staging areas for demolition equipment are in already developed areas. Migratory birds and sensitive wildlife species have been observed nesting on test stands, transformer poles, and other structures. These wildlife species would be expected to vacate the area during demolition and would possibly return when demolition ends. Large-scale demolition could intimidate wildlife through noise, human presence, and loss of habitat. Most wildlife would vacate the operation areas and return once vegetation had been reestablished. However, if demolition activities were to start during nesting season, individual organisms would be disturbed. Impacts to migratory birds would be ***moderate, negative, regional,*** and ***short term (Biology Impact-4a).*** Because of the small acreage affected by demolition, impacts to native vegetation communities as a result of the demolition activity would be ***minor, negative, local,*** and ***long term (Biology Impact-2a).*** Over time, the demolition would increase the amount of undeveloped, vegetated area and would have a ***minor, beneficial, local,*** and ***long-term*** impact ***(Biology Impact-2b)*** on surrounding native vegetation through increased habitat availability, rainfall infiltration, and slow stormwater runoff.

### Traffic and Transportation

The demolition activities are estimated to generate 193 average daily traffic (ADTs) and 44 peak hour trips (PHTs) in both the morning and afternoon peak hour. The addition of the estimated demolition-related traffic to the existing traffic volumes would be measureable. However, it would not cause an acceptably operating roadway to degrade to an unacceptable level of service, or cause a roadway with an unacceptable level of service to degrade further, so the demolition activities would result in a ***minor, negative, regional,*** and ***short-term*** impact to roadway operations ***(Traffic Impact-1).*** Within the project site, only a limited number of construction vehicles would operate along roadways at any given time. Although it would not be a large volume of traffic, it would result in a measureable increase of traffic on the limited roadway facilities within the project site, thereby resulting in a ***minor, negative, regional***, and ***short-term*** impact ***(Traffic Impact-1).*** The potential risk of truck traffic exposure to school children was estimated by roadway and by travel mode for each construction activity. It is estimated that up to 32,270 student trips could be exposed to the project-related truck traffic during the anticipated 1-year demolition period, as detailed in Table 4.5-4 in Section 4 of this EIS. This potential exposure would result in a ***moderate, negative, local,*** and ***short-term*** impact ***(Traffic Impact-2).***

### Water Resources

Evaluation criteria for water resources include changes in surface water and groundwater hydrology (drainage, stormwater runoff, local flooding, or percolation) and impacts to surface water or groundwater quality. Demolition would have a ***moderate, negative, local,*** and ***long-term*** impact on water resources. Demolition would remove impervious surfaces and disturb soil, thus increasing the potential for erosion. Demolition also would increase the potential for accidental releases of hazardous materials from construction equipment (fuel and lubricants) and from the demolished structures (lead-based paint and asbestos).

### Air Quality and Greenhouse Gasses Emissions

Emissions generated from demolition activities would not exceed the General Conformity *de minimis* threshold values for year 2014 and thus would have a ***negligible, negative, regional*****,** and ***short-term*** impact on air quality *(**Air Quality Impact-1**)*. Similarly, the greenhouse gas (GHG) emissions associated with demolition are approximately one-tenth of the CEQ threshold of 25,000 metric tons of carbon dioxide equivalent ($CO_2e$) and would, therefore, have a ***negligible, negative, regional*****,** and ***short-term*** impact on climate change *(**Air Quality Impact-1**)*. The estimates of particulate matter levels would be below the General Conformity *de minimis* threshold values.

### Environmental Justice

Up to 32,270 total student trips could be exposed to the project-related truck traffic during the anticipated 12- to 18-month demolition period (Table 4.5-4), of which an estimated 5,976 student exposures would occur while walking or bicycling. Part of the truck route is on a steep, windy road with some blind curves, which would require special care to avoid accidents. No disproportionately high and adverse impacts to minority populations or low-income populations would be expected from the proposed demolition activities *(**EJ Impact-1**)*. Overall, ***moderate, negative, local,*** and ***short-term*** impacts to the safety of children would be expected because of the increased exposure to truck traffic during the demolition phase *(**EJ Impact-2**)*.

### Health and Safety

Potential health and safety hazards associated with demolition could result from incidents such as exposure of workers to contamination, release of contamination, accidents involving heavy equipment, and debris. Because of the broad potential for injury or exposure, the health and safety impact resulting from demolition would be considered ***moderate, negative, local,*** and ***short term (Health Impact-2)****.*

### Noise

Demolition equipment associated with the Proposed Action also would generate onsite noise. The types of equipment used for demolition would be similar to equipment commonly used for construction, including backhoes, bulldozers, loaders, dump trucks, and paving equipment. Demolition and construction noise impacts on the NASA-administered property would be ***minor, negative, local,*** and ***short term (Noise Impact-1).***

### Site Infrastructure and Utilities

Demolition includes removal of all infrastructure described in Section 3.2 of this report, with the exception of electrical and potentially water supply services required for site-specific remedial technologies. Demolition is likely to begin prior to commencement of the soil cleanup activities, thus some utility infrastructure would be removed as part of the demolition and some would remain to support cleanup activities. The demolition of these facilities would be a ***negligible, negative, local,*** and ***long-term*** impact on site infrastructure, because NASA no longer uses the buildings within these areas and the infrastructure supporting these buildings is no longer needed *(**Infrastructure Impact-1**)*. Temporary utility service would be required to support the temporary field office trailer and would include, at a minimum, electrical and water service. Because utility service is already present, the impact to add such infrastructure to support the demolition and cleanup efforts would be ***minor, negative, local,*** and ***short term (Infrastructure Impact-2)****.*

### Hazardous and Nonhazardous Material Waste

Demolishing test stands, buildings, and ancillary structures on the NASA-administered property at SSFL would result in a ***minor, negative, regional***, and ***long-term*** impact by generating waste materials that include hazardous wastes, nonhazardous wastes, mixed wastes, and/or other classifications with specific management or disposal requirements. NASA would characterize materials as hazardous or nonhazardous after demolition and before materials were loaded onto trucks or trailers for transport to an approved offsite waste facility.

# Summary of Impacts for Soil and Groundwater Cleanup

## Significant Impacts

### Soils, Landslide Potential, Topography, and Paleontological Resources

Impacts from soil cleanup to this resource area would be primarily from ground disturbance as a result of 320,000 $yd^3$ or more of contaminated soil being excavated. Because of the use of this invasive remediation, erosion effects would be ***significant, negative, local*** to ***regional,*** and ***short term.*** The potential for landslides would be ***minor, negative, local,*** and ***short term***. Finally, the changes to topography potentially would be ***negligible*** to ***minor, negative, local***, and ***short term***, depending on the backfill used in the excavated areas or remediated soils left after treatment. The potential to encounter paleontological resources is low and, therefore, would have a ***negligible, negative, local***, and ***long-term*** potential impact.

### Cultural Resources

NASA has determined that to meet the AOC cleanup requirements,  a total area of more than 100 acres must be excavated to at least a depth of 2 feet (ft) and disposed of offsite. Based on research and archeological surveys of the NASA-administered land at SSFL, the Proposed Action would have an adverse effect on the archaeological resources under Section 106 of the NHPA.

Soil disturbance during cleanup would have a ***significant, negative, regional***, and ***long-term*** impact on the Burro Flats archeological site that is listed in the NRHP and the California Register of Historic Resources. The Proposed Action also could impact a second potentially NRHP-eligible archeological site in the northern portion of the project area.

A Traditional Cultural Property (TCP) has been identified within the NASA-administered property. Because of the soil excavation requirements, the proposed action would have a ***significant, negative, regional,*** and ***long-term*** impact on the TCP.

The NASA-administered portion of SSFL has been formally designated by the Santa Ynez Band of Chumash Indians as an Indian Sacred Site under Executive Order 13007. The Proposed Action would have a ***significant, negative, regional,*** and ***long-term*** impact on the Indian Sacred Site.

### Biological Resources

Because the top 2 ft of soil (at a minimum) would be excavated, all existing biological resources within the contaminated areas, including 32 acres of sensitive habitats, would be eliminated. The Proposed Action would result in a ***significant, negative, regional***, and ***long-term*** impact because of the amount of ground disturbance that would occur. Additionally, changes to soil profiles (the micro and macro fauna of the soil ecosystems) are expected to be ***significant.*** The extensive level of excavation necessary to meet the AOC would lead to soil instability, decreased vegetative biodiversity, and increased spread of invasive weeds.

### Traffic and Transportation

Traffic and transportation impacts are analyzed in three categories: (1) roadway operations and level of service; (2) potential exposure of school children to truck traffic; and (3) potential safety effects from the project-related truck trips, pavement conditions, and parking. Two areas of impact are considered: first, roadways within SSFL and the local roadway network (Woolsey Canyon, Roscoe, and Topanga Canyon); and second, the regional network including Interstate (I)-405, I-5, I-210, and SR 14.

The primary impacts on this resource area would result from truck traffic along the routes accessing SSFL for environmental cleanup activity. Excavation soil cleanup methods would generate between 320,000 and 500,000 $yd^3$ of soil. The high volume of heavy vehicle trips needed to haul this waste material offsite would result in a ***significant, negative, regional***, and ***long-term*** impact to local pavement conditions on some roadways leading to SSFL (Roscoe, Valley Circle, and Woolsey Canyon).

***Moderate, negative, local,*** and ***short-term*** impacts to the safety of children would be expected because of an increased exposure to truck traffic. Part of the truck route is on a steep, windy road with some blind curves, increasing the potential for an accident to occur. The potential for even one accident involving a child is significant and unacceptable.

NASA is evaluating whether technologies can effectively treat rather than excavate some soil to Look-Up Table values. This approach could reduce the volume of soil to be transported offsite for disposal by approximately 36 percent (320,000 $yd^3$ compared to 500,000 $yd^3$of soil), and thereforefewer truck trips would be needed. Traffic from soil remediation (after excavation is complete) and groundwater cleanup would be limited to the onsite work because offsite disposal would not be necessary.

## Moderate Impacts

### Water Resources

Soil and groundwater cleanup technologies would result in increased erosion potential, changes in hydrology (both surface water and groundwater), impairment of Section 303(d)-listed water bodies, and impacts to the quality of surface water and groundwater. ***Moderate, negative, local,*** and ***long-term*** impacts on surface and groundwater quality would result from excavation of up to 500,000 $yd^3$ of soil, ex situ treatments, or the insertion of injection wells. These would have the greatest potential for ground disturbance by increasing sedimentation and the potential for contamination migration. The potential changes in hydrology would be ***minor*** to ***moderate, negative, local*****,** and ***long term***, and would depend on the design of the soil remediation and its proximity to excavated areas.

### Air Quality and Greenhouse Gas Emissions

***Moderate, negative, regional***, and ***short-term*** impacts on air quality and climate change could result from operating equipment, vehicles, and power sources, and from dust generation resulting from excavation of up to 500,000 $yd^3$ of soil. National Ambient Air Quality Standards (NAAQS) criteria pollutants (a set of air pollutants that cause smog, acid rain, and other health hazards) were estimated. Additionally, CEQ thresholds for GHG emissions were estimated. The majority of GHG emissions are from vehicles transporting soil to landfills for offsite disposal and are greater than the CEQ threshold of 25,000 metric tons of $CO_2e$ during at least one year. Therefore, the emissions would have a ***moderate, negative, regional,*** and ***short-term*** impact on climate change *(**Air Quality Impact-3a**)*. If the cleanup period were extended beyond 2017, the annual GHG emissions from trucks would be less than the CEQ threshold.

A screening assessment was performed to evaluate the potential impact on air quality and GHG emissions from operating soil and groundwater remedial technologies. Technologies that would require a significant power source, use combustion, generate fugitive dust or VOC emissions, or rely on heavy-duty trucks or equipment were evaluated qualitatively based on preliminary engineering data or industry standard practices. Additionally, how long the technology would need to operate was considered. Table ES-4 provides the potential emissions from proposed demolition and environmental cleanup.

TABLE ES-4
**Potential Emissions from Proposed Demolition and Environmental Cleanup**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| General Conformity *de minimis* Threshold | NAAQS | CEQ (GHG Emissions) |
|---|---|---|
| Demolition | Below | Below |
| Excavation/Offsite Disposal | Above | Above |
| Other Technologies | Below | Below |

The General Conformity rule was created to prevent federal projects from jeopardizing a state's ability to achieve air quality standards. The General Conformity evaluation determines whether a proposed project's emissions for criteria pollutants are above or below *de minimis* threshold levels.

#### Environmental Justice

The EIS assessed potential impacts from soil and groundwater cleanup on minority and low-income populations within the ROI, based on 49 census block groups (depicted in Figure 3.12-2) that are either adjacent to the SSFL property and potentially could be affected by remedial activities, or are adjacent to or near (within approximately 1 mile of) the local roadway network used by trucks accessing SSFL during implementation of the Proposed Action. The impacts for the proposed action would be ***moderate, negative, local***, and ***short term*** for environmental justice resource areas. The primary potential impacts would be to the safety of children or minority and low-income populations from the additional truck traffic, most of which would occur during the remediation phase of the Proposed Action, in particular if excavation and offsite disposal of 500,000 $yd^3$ of soil is necessary. Other soil remediation technologies would require less soil removal (320,000 $yd^3$), less truck traffic, and thus less potential impact to health and safety. Groundwater cleanup technologies would not result in additional impacts to minority and low-income populations or to children.

Of the 49 block groups evaluated, 18 Los Angeles County block groups have at least 50 percent minority populations, and 9 of those block groups have a minority population that is meaningfully greater than the population of the ROI. Six block groups were identified as low-income populations.

Five block groups in Ventura County are adjacent to SSFL. The Summit and Mountain View mobile home communities along Woolsey Canyon Road were specifically analyzed, as requested by local community members. This block group is 17 percent minority, which is below the average for the ROI and the county, and has a 0 percent poverty rate. None of the Ventura County block groups meets the criteria for minority or low-income populations and, as such, there is little or no potential for disproportionate impacts to minority and low-income populations living in proximity to SSFL.

A further analysis was conducted on minority and low-income populations lying along the local roadway network used by trucks accessing SSFL. Overall, 33 block groups in the region of influence are adjacent to the truck routes and 13 block groups are near (not adjacent to but within 1 mile of) the truck routes. In assessing these, the block groups were assigned a potential environmental justice impact score based on their proximity to truck routes, percent minority population, percent poverty rate, etc. This assessment indicated that none of these block groups meets the criteria for minority or low-income populations and, as such, there is little potential for disproportionately high or adverse environmental justice effects related to increased truck traffic.

#### Health and Safety

***Moderate, negative, local,*** and ***short-term*** impacts to health and safety of onsite work crews would be expected from demolition and environmental cleanup activities. The potential for injury or exposure is broad and includes exposure to hazardous materials, safety hazards to utilities (gas and electric), physical hazards such as slips and falls or being struck by heavy equipment or debris, and natural hazards such as poison oak, stinging insects, and rattlesnakes. Additional health and safety factors might include dust generated from demolition activities, which potentially could expose workers to contaminated soil. Removal of contaminated soil and improvement to groundwater from the Proposed Action would result in ***minor, beneficial, local,*** and ***long-term*** impacts to future users of the site.

### Minor and Negligible Impacts

#### Site Infrastructure and Utilities

The Proposed Action would result in a potential for impacts to potable water supply; systems that provide natural gas, sewer, and electrical service; and the communications system. ***Minor, negative, local*****,** and ***short-term*** impacts are associated with the removal of natural gas and electrical infrastructure because of the inherent safety concerns with explosion, electrocution, and fire.

Proposed soil cleanup technologies potentially requiring utility service to operate include SVE, ex situ treatment using thermal desorption, in situ physical treatment using soil mixing, in situ chemical oxidation, and in situ anaerobic or aerobic biological treatment. Groundwater cleanup technologies include pump-and-treat, vacuum extraction, and heat-driven extraction. Maintaining utility service to these technologies might require rerouting or expansion of service before site work. Interruption of services creates a potential ***negligible, negative, local,*** and ***long-term*** impact.

### Noise

The EIS compared existing noise levels on NASA-administered property to estimated future noise levels associated with proposed environmental cleanup activities. ***Minor, negative, local,*** and ***short-term*** (an estimated period of 3 years) noise impacts would result from increased traffic volumes. Existing noise levels range from 52- to 61-decibel (A-weighted) (dBA) community noise equivalent level at a distance of 100 ft. An estimated 16,800 and 26,000 truck trips from excavation and disposal would result in an increase of 3-dBA change in noise levels along the designated truck routes at a distance of 100 ft. Under the Proposed Action, the frequency and duration of truck traffic would be measurably and noticeably higher than the existing conditions; as such, the overall increase in noise would be perceptible.

### Hazardous and Nonhazardous Materials and Waste

Among the soil cleanup technologies, excavation with offsite disposal is the only activity that would result in ***negligible, negative, regional,*** and ***long-term*** impacts for nonhazardous waste disposal facilities and ***minor*** to ***moderate*** impacts for hazardous waste disposal facilities based on inquiries with multiple disposal facilities and information about remaining waste capacity. The potential for the release of contamination during environmental cleanup activities would result in a ***minor, negative, local*** to ***regional,*** and ***short-term*** impact.

### Beneficial Impacts

Beneficial impacts resulted primarily from the reduction of contaminants at the site and the removal of buildings and paved areas. The soil and groundwater cleanup action would reduce the amount of contamination across the site and result in less risk of exposure to humans and wildlife. Over time, the demolition would increase the amount of undeveloped, vegetated area and would have a beneficial impact on surrounding native vegetation through increased habitat availability, rainfall infiltration, and slow stormwater runoff. Because of the removal of impervious surfaces, the amount of runoff potential would be reduced and infiltration potential would be increased. As a result, the impact on hydrology and drainage could be a beneficial impact. Several commenters expressed concerns that these benefits would be less than NASA anticipates and would be overshadowed by the negative effects.

## Summary of Best Management Practices and Mitigation Measures

The EIS considers mitigation measures and best management practices that address potential impacts. Mitigation includes avoiding, minimizing, rectifying, reducing, eliminating, or "compensating for an impact by replacing or providing substitute resources or environments" (40 CFR 1508.20). Table ES-5 provides a summary of the resource area impacts and mitigation measures described in Sections 5.1 through 5.3. Some impacts are difficult to mitigate and NASA may not be able to reduce their level of impact through mitigation. For example, NASA may mitigate the impact of the demolition of historic structures through documentation or other measures identified in the Section 106 process, but these mitigation measures do not reduce the overall impact. However, some mitigation measures and best management practices associated with listed species can reduce any potential for impacts to those species.

## Summary of Cumulative Impacts

Cumulative activities were identified that might occur in the same area or timeframe as the Proposed Action. These activities were evaluated to identify potential environmental impacts that, when added to the Proposed Action's impacts, would result in a cumulative effect as a result of past, present, and reasonably foreseeable future actions. The EIS considered the Proposed Action with the adjacent environmental cleanup activities being conducted by DOE and Boeing. When considered together, cumulative impacts would result from trucks on the local roadway networks, further degraded roadway conditions, demolition of structures, safety risk to children, and increased noise levels. Similarly, soil and vegetation removal and other SSFL restoration and remediation activities that were considered would have cumulative impacts on vegetation communities and cultural resources such as an Indian Sacred Site. Finally, the amount of hazardous and nonhazardous material transported and disposed of would cumulatively burden the designated disposal facilities. Table ES-6 provides a summary of cumulative effects specific to each environmental resource analyzed in this EIS. For comparison, the overall impact (without mitigations and BMPs) is provided also to compare against the cumulative impact (with mitigations and BMPs). In general, impacts that were already significant from NASA's activities would have increased negative effects.

TABLE ES-5
**Summary of Impacts and Mitigation Measures at Santa Susana Field Laboratory**
*NASA SSFL EIS for the Proposed Demolition and Environmental Cleanup*

| Resource Area | Project Alternatives[a] | | Best Management Practices and Mitigation Measures[a] | Impact After Best Management Practices and Mitigation Measures Implementation[a] |
|---|---|---|---|---|
| | **Proposed Action** | **No Action** | | |
| Section 4.2 - Soils, Landslide Potential, Topography, and Paleontological Resources | Significant, negative, regional, long term<br>● | Negligible, negative, local, short term<br>○ | Soils BMP-1 (Site selection and preparation to minimize erosion and slope failure)<br>Water BMP-1 (Develop SWPPP)<br>Air Quality MM-3 (Develop Dust Control Plan)<br>Biology BMP-1 (Revegetation and topsoil replacement)<br>Biology BMP-2 (Revegetation with erosion control) | Negligible to minor, negative, local, long term<br>◯ |
| Section 4.3 - Cultural Resources | Significant, negative, regional, long term<br>*Adverse effect under Section 106*<br>● | No impact<br>▽ | Cultural MM-1 (Defer demolition of some structures)<br>Cultural MM-2 (Documentation of structures)<br>Cultural MM-3 (Treatment of Traditional Cultural Property)<br>Cultural MM-4 (Treatment of Burro Flats site)<br>Cultural MM-5 (Treatment of other archeological properties) | Significant, negative, regional, long term<br>● |
| Section 4.4 - Biological Resources | Significant, negative, regional, long term<br>● | Negligible, negative, local, long term<br>○ | Biology BMP-1 (Revegetation and topsoil replacement)<br>Biology BMP-2 (Revegetation with erosion control)<br>Biology BMP-3 (Remove wells and restore with an approved native seed mix)<br>Biology BMP-4 (Consulting with USFWS)<br>Biology BMP-5 (Proper permitting)<br>Biology MM-1 (Protection of sensitive species)<br>Biology MM-2 (Avoid Santa Susana tarplant)<br>Biology MM-3 (Noxious weed management)<br>Biology MM-4 (Protection of migratory birds)<br>Biology MM-5 (Protection of red-legged frog)<br>Water BMP-1 (Develop SWPPP)<br>Air Quality MM-3 (Develop a Dust Control Plan) | Significant, negative, regional, long term[b]<br>● |
| | Minor, beneficial, regional, long term<br>▣ | Minor, negative, regional, long term<br>◯ | | N/A |

TABLE ES-5
**Summary of Impacts and Mitigation Measures at Santa Susana Field Laboratory**
*NASA SSFL EIS for the Proposed Demolition and Environmental Cleanup*

| Resource Area | Project Alternatives[a] | | Best Management Practices and Mitigation Measures[a] | Impact After Best Management Practices and Mitigation Measures Implementation[a] |
|---|---|---|---|---|
| | **Proposed Action** | **No Action** | | |
| Section 4.5 - Traffic and Transportation | Significant, negative, regional, long term ● | Minor, negative, regional, long term ⭘ | Traffic MM-1 (Develop Construction Transportation Control Plan)<br>Traffic MM-2 (Road repairs) | Minor, negative, regional, short term ⭘ |
| Section 4.6 - Water Resources | Moderate, negative, local, long term ◉ | Moderate, negative, potentially regional, long term ◉ | Water BMP-1 (Develop SWPPP) | Negligible, negative, local, long term ○ |
| | Moderate, beneficial, regional, long term ▣ | Moderate, negative, potentially regional, long term ◉ | | N/A |
| Section 4.7 - Air Quality and Greenhouse Gas Emissions | Moderate, negative, regional, short term ◉ | Negligible, negative, regional, short term ○ | Air Quality BMP-1 (Dust control)<br>Air Quality MM-1 (Purchase NOx offsets)<br>Air Quality MM-2 (Select closer disposal facilities or use alternative-fueled equipment and vehicles)<br>Air Quality MM-3 (Develop Dust Control Plan) | Moderate, negative, regional, short term[c, d] ◉ |
| Section 4.8 - Environmental Justice | Moderate, negative, local, short term ◉ | Negligible, negative, local, short term ○ | Traffic MM-1 (Develop Construction Transportation Control Plan) | Moderate, negative, local, short term ◉ |
| Section 4.9 - Health and Safety | Moderate, negative, local, short term ◉ | Moderate, negative, local, long term ◉ | Health BMP-1 (Develop Health and Safety Plan)<br>Health BMP-2 (Update SSFL Standard Operating Procedures)<br>Health BMP-3 (Develop Hazardous Substance Control and Emergency Response Plan)<br>Air Quality MM-3 (Develop Dust Control Plan) | Negligible, negative, local, long term ○ |
| | Minor, beneficial, local, long term ▣ | Moderate, negative, local, long term ◉ | | N/A |
| Section 4.10 - Site Infrastructure and Utilities | Minor, negative, local, short term ⭘ | No impact ▽ | Infrastructure BMP-1 (Coordination with utility provider)<br>Infrastructure-MM-1 (Infrastructure and utilities removed prior to soil excavation activities) | Minor, negative, local, short term ⭘ |

TABLE ES-5
**Summary of Impacts and Mitigation Measures at Santa Susana Field Laboratory**
*NASA SSFL EIS for the Proposed Demolition and Environmental Cleanup*

| Resource Area | Project Alternatives[a] | | Best Management Practices and Mitigation Measures[a] | Impact After Best Management Practices and Mitigation Measures Implementation[a] |
|---|---|---|---|---|
| | **Proposed Action** | **No Action** | | |
| Section 4.11 - Noise | Minor, negative, local, short term<br>⭘ | Negligible, negative, local, long term<br>○ | Noise MM-1 (Daylight hour work restrictions)<br>Noise-MM-2 (Equipment and truck maintenance) | Negligible, negative, local, short term<br>○ |
| Section 4.12 - Hazardous and Nonhazardous Materials and Waste | Minor, negative, regional, long term<br>⭘ | Moderate, negative, local to regional, long term<br>◉ | Haz BMP-1 (Hazardous material handling protocol)<br>Haz BMP-2 (Develop Hazardous Materials Business Management Plan)<br>Health BMP-1 (Develop Health and Safety Plan)<br>Water BMP-1 (Develop SWPPP)<br>Air Quality MM-3 (Develop Dust Control Plan) | Minor, negative, regional, short term<br>⭘ |

Notes:

● or ■ = Significant

◉ or ▣ = Moderate

⭘ or ◘ = Minor

○ or □ = Negligible

▽ = No impact

Circular symbols represent negative impacts while square symbols represent beneficial impacts, and the degree to which the symbol is filled represents the severity of the impact.

BMP = best management practice
HABS/HAER = Historic American Building Survey/Historic American Engineering Record
MM = mitigation measure
NOx = oxides of nitrogen
RWQCB = Regional Water Quality Board
SWPPP = Stormwater Pollution Prevention Plan
USFWS = U.S. Fish and Wildlife Service
USACE = U.S. Army Corps of Engineers

[a] Potential impacts, BMPs, and mitigation measures are discussed further in relevant portions of Section 4.
[b] Mitigation is dependent on consultation with USACE for Clean Water Act (CWA) Section 404 permit and RWQCB for CWA Section 401 permit.
[c] Standard mitigation measures are prescribed to offset fugitive dust emissions by Ventura County Air Pollution Control District Rule 55 and implemented under the ISRA program implemented by NASA.
[d] The extent to which GHG emissions would be reduced by Air Quality-MM-2 is dependent on the extent to which alternative fuels are implemented in construction equipment and haul trucks.

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TABLE ES-6
**Summary of Cumulative Impacts without Mitigations or Best Management Practices**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Resource Area | Overall Impact[a] | Cumulative Impact[b] | Notes |
|---|---|---|---|
| Soils, Landslide Potential, Topography, and Paleontological Resources | Significant, Negative | Minor, Negative | Joint remediation and demolition activities by Boeing, DOE, and NASA can result in increased erosion of soil resulting in increased dust, water contamination, and loss of top soil, thus affecting air quality, water quality, and biological resources. |
| Cultural Resources | Significant, Negative | Significant, Negative | Boeing and NASA remediation could require the removal of soils at the Burros Flats site resulting in the disturbance of a known archeological site with significance to Native Americans.<br>Demolition of historic structures and districts contributes to cumulative impacts to cultural resources.<br>Boeing, DOE, and NASA activities could impact the Indian Sacred Site through soil and vegetation removal and other ground-disturbing activities. |
| Biological Resources | Significant, Negative | Significant, Negative | Boeing, DOE, and NASA activities can impact natural habitat, wetlands, and sensitive plants and wildlife. Removal of soils increases the loss of native plants thus reducing habitat. Remediation activities near or on wetlands can disturb these protected habitats. |
| | Minor, Beneficial | Moderate, Beneficial | Remediation of contaminated areas could reduce contamination in the area. |
| Traffic and Transportation | Significant, Negative | Minor, Negative | Combined Boeing, DOE, and NASA truck traffic can damage roads. Combined Boeing, DOE, and NASA activities can increase the amount of traffic to which children are exposed posing both a safety risk and health risk as children travel to and from school. |
| Water Resources | Moderate, Negative | Negligible, Negative | Boeing, DOE, and NASA activities can result in decreased surface water and ground water quality, and change the groundwater hydrology at SSFL. |
| | Moderate, Beneficial | Moderate, Beneficial | Erosion and movement of soils can increase sediment and contaminants in water.<br>Remediation could improve water quality. |
| Air Quality and Greenhouse Gas Emissions | Moderate, Negative | Significant, Negative | Combined air emissions from Boeing, DOE, and NASA activities can decrease air quality by increasing dust, particulate matter, smog, etc. Climate change is affected by the increased GHG emissions from the combined truck traffic. |
| Environmental Justice | Moderate, Negative | Minor, Negative | Combined Boeing, DOE, and NASA activities can increase the amount of traffic to which children are exposed posing both a safety risk and health risk as children travel to and from school. |
| Health and Safety | Moderate, Negative | Negligible, Negative | Combined Boeing, DOE, and NASA activities can result in more exposure to hazardous materials, safety hazards, structural hazards, and natural hazards. |
| | Minor, Beneficial | Minor, Beneficial | Remediation would reduce hazardous materials onsite. |
| Infrastructure and Utilities | Minor, Negative | Minor, Negative | Boeing, DOE, and NASA remediation can increase the probability of prolonged loss of utilities. |

TABLE ES-6
**Summary of Cumulative Impacts without Mitigations or Best Management Practices**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Resource Area | Overall Impact[a] | Cumulative Impact[b] | Notes |
|---|---|---|---|
| Noise | Minor, Negative | Minor, Negative | Combined Boeing, DOE, and NASA truck traffic can increase the noise level and disturbance to the local community. |
| Hazardous and Nonhazardous Materials and Waste | Minor, Negative | Moderate, Negative | More hazardous waste would be generated as a result of the removal of contaminated soils and groundwater by Boeing, DOE, and NASA. |

Notes:
[a] Potential impacts are discussed further in Section 4.13 and assume BMPs and mitigation measures are not implemented.
[b] Potential impacts are discussed further in Section 4.13 and assume BMPs and mitigation measures will be implemented for negative impacts.

# Unavoidable Adverse Impacts

Implementing the Proposed Action to meet the AOC would result in the excavation of non-treatable soils to a depth of 2 ft (and in some places to 20 ft deep) from approximately 105 acres. There is a potential for the 105 acres to increase in size as NASA completes its soil sampling work in 2014. Some of these acres are covered by roads, buildings, or parking lots (roughly 43 acres or 41 percent). The rest (62 acres or 49 percent) is open space and would require the removal of all existing vegetation, such as shrubs, plants, and trees. Additionally, removing the large volume of soil would change soil profiles (the micro and macro fauna of the soil ecosystems) over the 105 acres and lead to soil instability, decreased vegetative biodiversity, and increased spread of invasive weeds. The impact to natural vegetation communities includes some species of interest to Native Americans. The removal of natural vegetation communities and the digging up and removal of the non-treatable soils could have an adverse impact on an Indian Sacred Site and also may impact some archeological sites if they cannot be avoided.

Some demolition is necessary to access and remediate contaminated soils beneath or adjacent to structures. The remaining demolition is anticipated to be completed to facilitate the disposition of the property because the structures may be covered in lead paint or have no anticipated beneficial future use. Demolition of structures such as the test stands would have an adverse impact on the historic districts for which they are the key anchor facilities.

Lastly, in anticipation of the transport of at least 320,000 $yd^3$ (and potentially 500,000 $yd^3$) of soil from NASA-administered property, plus the DOE and Boeing cleanup work requiring heavy-duty truck traffic, the impact to the local roads could be significant. Because the AOC requires cleanup to background levels, the excavation and offsite disposal is unavoidable.

# Incomplete and Unavailable Information

NEPA guidance states, “When an agency is evaluating reasonably foreseeable significant adverse effects on the human environment in an environmental impact statement and there is incomplete or unavailable information, the agency shall always make clear that such information is lacking” (40 CFR 1502.22). NASA acknowledges that some studies relevant to the proposed action are not complete in this Final EIS.

NASA has reviewed a broad range of reasonable remedial technologies that could achieve the cleanup goals for both the SSFL soil and groundwater cleanups. This EIS examines the potential environmental effects from each cleanup technology that is feasible, implementable, and effective. Ongoing treatability studies may eventually prove some of the technologies are not capable of meeting the cleanup goals and thus eliminate them as a final remedy. Additionally, these treatability studies may further refine specific site locations where implementation could achieve cleanup goals, thus reducing the need for excavation in some areas.

Site characterization work is ongoing for both soil and groundwater. Completion of this work will allow for the finalization of the areas of soil requiring cleanup to meet the AOC as well as the risk-based groundwater cleanup. The NASA EIS evaluates the likely volume of soil requiring treatmentexcavation to meet the AOC and the potential treatment technologies for soil and groundwater based on current information. Should the results of the site characterization work or the treatment technology studies determine significant changes to current conditions evaluated in the EIS, NASA would update the environmental impact analysis.

# Required Permits, License, and Approvals

The methods NASA would use to demolish existing structures and perform soil and groundwater cleanup have been evaluated in accordance with federal, state, and local regulations relevant to each environmental resource area analyzed in this EIS.

The following permits, licenses, and approvals likely would be required for the Proposed Action and would be obtained before implementation of the proposed demolition or environmental cleanup activities:

- CWA Section 404 Dredge and Fill Permit, USACE
- CWA Section 401 Water Quality Certification, RWQCB
- California General Permit for Stormwater Discharges Associated with Construction Activity, State Water Resources Control Board
- National Pollutant Discharge Elimination System Permit, Los Angeles RWQCB
- Biological Opinion, USFWS
- Endangered Species Act, Section 7 Consultation with USFWS
- Section 106 Consultation, State Historic Preservation Officer (SHPO), Advisory Council on Historic Preservation (ACHP), Consulting Parties, and NASA

Other specific permits, licenses, and approvals might be required depending on the selection of specific soil or groundwater cleanup technologies. These include a VOC and SVOC emissions permit, hazardous materials storage permit, Class V injection permit, and/or an air permit.

# Agency Consultations

Federal and state agencies, Native American Tribes, other organizations, and members of the public having a potential interest in the Proposed Action were consulted and invited (under NEPA and the NASA Procedural Requirements 8580.1 [NASA, 2001, 2008a]) to participate in the decision-making process during NASA's environmental review process for the proposed demolition and environmental cleanup activities at SSFL. NASA currently is consulting with the SHPO and ACHP, and individuals who requested to be NHPA Section 106 consulting parties for this project, on mitigation measures to address effects on historic properties. Mitigation is proposed as part of the EIS and will be finalized in the ROD in accordance with Section 106. NASA also is consulting with USFWS to finalize a Biological Opinion and to develop mitigation for protecting migratory birds and minimizing the effects on federally listed species. NASA is coordinating with the California Department of Fish and Wildlife to effectively evaluate and minimize the effects on state-listed rare and sensitive species. Finally, NASA is consulting with the USACE to minimize project impacts on wetlands and waters of the U.S.

# Relationship Between Local Short-term Use of the Environment and Long-term Productivity

NEPA requires an analysis of the relationship between a project's short-term impacts on the environment and the effects of those impacts on the maintenance and enhancement of the long-term productivity of the environment. Impacts that limit future uses of the site are of particular concern. "Short term" refers to the total duration of demolition and soil cleanup activities until the property is recognized as suitable for transfer, while "long term" refers to an indefinite period beyond property transfer. While the Proposed Action (i.e., short-term use) would likely result in impacts that would reduce the long-term environmental productivity of the NASA-administered portion of SSFL, cleanup of soils to Look-Up Table values would provide a beneficial long-term impact for the overall reduction of contaminants across the site as well as exposure risk to wildlife and humans.

Demolition activities could include the removal of historic structures that individually are eligible for NRHP listing or contribute to an NRHP-eligible district. Proposed demolition and excavation activities could have long-term impacts on productivity or use of historic properties, archeological features, and an Indian Sacred Site, and could result in a reduction in native vegetation.

## Maintenance and Enhancement of Irreversible and Irretrievable Commitments of Resources

NEPA and NASA Procedural Requirement 8580.1 (NASA, 2001, 2008a) require that an agency analyze the extent to which the Proposed Action could commit nonrenewable resources that would be irreversible or irretrievable to future generations. Construction of some remedial technologies would consume a small quantity of building materials. Petroleum, oils, and fuels would be used by construction and demolition equipment, transport vehicles, and crew vehicles. Soil remediation (SVE, ex situ treatment using thermal desorption) and groundwater remediation (pump-and-treat, vacuum extraction, and heat-driven extraction) would consume energy. Water also would be needed for dust suppression and to operate certain drilling and remediation equipment. Much of the concrete and building materials recovered from demolition would be disposed as nonhazardous waste because materials such as concrete, steel, soils, or water tested to be uncontaminated could be reclaimed, recycled, and/or reused.

Paleontological resources might be encountered during deeper earthwork. Archeological resources and historic resources have been documented on the NASA-administered property at SSFL. These resources are considered nonrenewable and, if affected, the impact essentially would be irreversible. NASA is consulting with the SHPO and the federal ACHP to develop appropriate measures for avoiding negative impacts where possible or, otherwise, mitigating impacts to these resources.

*Final*

# Environmental Impact Statement for Proposed Demolition and Environmental Cleanup Activities at Santa Susana Field Laboratory, Ventura County, California

Prepared for

National Aeronautics and Space Administration

March 2014

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# Acronyms and Abbreviations

| | |
|---|---|
| °F | degrees Fahrenheit |
| μg/kg | micrograms per kilogram |
| μg/L | micrograms per liter |
| ACHP | Advisory Council on Historic Preservation |
| ACI | Archaeological Consultants, Inc. |
| ACS | American Community Survey |
| ADT | average daily traffic |
| AIG | area of impacted groundwater |
| AOC | Administrative Order on Consent for Remedial Action |
| APE | area of potential effect |
| ARB | Air Resources Board (California) |
| AST | aboveground storage tank |
| BaP | benzo(a)pyrene |
| bgs | below ground surface |
| BMP | best management practice |
| Boeing | The Boeing Company |
| C&D | construction and demolition |
| CAA | Clean Air Act |
| Cal/OSHA | California Occupational Safety and Health Administration |
| Cal/EPA | California Environmental Protection Agency |
| Caltrans | California Department of Transportation |
| CAMU | corrective action management unit |
| CAO | Cleanup and Abatement Order (RWQCB) |
| CC | Alpha CC Engineering Trailer Control Center |
| CDFA | California Department of Food and Agriculture |
| CDFW | California Department of Fish and Wildlife |
| CDL | commercial driver's license |
| CECR | Construction and Environmental Compliance and Restoration |
| CEQ | Council on Environmental Quality |
| CEQA | California Environmental Quality Act |
| CFOU | Chatsworth Formation Operable Unit |
| CFR | *Code of Federal Regulations* |
| $CH_4$ | methane |
| CHRIS | California Historical Resources Information System |
| CHSC | California Health and Safety Code |
| CNEL | community noise exposure level |
| CNPS | California Native Plant Society |

| | |
|---|---|
| CO | carbon monoxide |
| $CO_2$ | carbon dioxide |
| $CO_2e$ | carbon dioxide equivalent |
| COC | contaminant of concern |
| Consent Order | Consent Order for Corrective Action |
| COPC | contaminants of potential concern |
| CRHR | California Register of Historic Resources |
| CRWQCB | California Regional Water Quality Control Board |
| CTCP | Construction Transportation Control Plan |
| CWA | Clean Water Act |
| dB | decibel |
| dBA | decibel (A-weighted) |
| DCE | dichloroethene |
| DEIS | Draft Environmental Impact Statement |
| DEPH | diethylhexyl phthalate |
| DNL | day-night noise level |
| DOE | U.S. Department of Energy |
| DOT | U.S. Department of Transportation |
| DPM | diesel particulate matter |
| DTSC | Department of Toxic Substances Control |
| EB | east bound |
| ECL | Engineering Chemistry Laboratory |
| ECP | Erosion Control Plan |
| EFH | extractable fuel hydrocarbons |
| EIR | Environmental Impact Report |
| EIS | Environmental Impact Statement |
| ELV | Expendable Launch Vehicle |
| EO | Executive Order |
| EPA | U.S. Environmental Protection Agency |
| ERA | Ecological Risk Assessment |
| ETEC | Energy Technology and Engineering Center |
| FDOT | Florida Department of Transportation |
| FEIS | Final Environmental Impact Statement |
| FEMA | Federal Emergency Management System |
| FHWA | Federal Highway Administration |
| FR | *Federal Register* |
| ft | feet |
| GAC | granular activated carbon |
| GBVAB | Great Basin Valley Air Basin |

| | |
|---|---|
| GETS | groundwater extraction and treatment system |
| $GH_2$ | gaseous hydrogen |
| GHe | gaseous helium |
| GHG | greenhouse gas |
| GIS | geographical information system |
| $GN_2$ | gaseous nitrogen |
| gpd | gallons per day |
| GSA | General Services Administration |
| ha | hectare |
| HABS | Historic American Building Survey |
| HAER | Historic American Engineering Record |
| HAZWOPER | Hazardous Waste Operations and Emergency Response Standard |
| HCM | *Highway Capacity Manual* |
| HFC | hydrofluorocarbon |
| HSP | Health and Safety Plan |
| I | Interstate |
| ICRMP | Integrated Cultural Resources Management Plan |
| ISRA | interim source removal action |
| ITP | Incidental Take Permit |
| LBP | lead-based paint |
| $L_{dn}$ | day-night noise level |
| LEOS | laser and electro-optical system |
| $L_{eq}$ | equivalent noise level |
| LF | linear foot |
| LH2 | liquid hydrogen |
| LLRW | low-level radioactive waste |
| LOS | level of service |
| LOX | liquid oxygen |
| MCL | maximum contaminant level |
| MDAB | Mojave Desert Air Basin |
| mg/kg | milligrams per kilogram |
| mg/L | milligram per liter |
| mL | milliliter |
| mL/L | milliliter per liter |
| MM | mitigation measure |
| MNA | monitored natural attenuation |
| mph | miles per hour |
| MSAT | mobile source air toxic |
| msl | mean sea level |

| | |
|---|---|
| MX | mixed (technology) |
| n.d. | not dated |
| N/A | not applicable |
| $N_2O$ | nitrous oxide |
| NAA | North American Aviation |
| NAAB | Native American Advisory Board |
| NAAQS | National Ambient Air Quality Standards |
| NAHC | Native American Heritage Commission |
| NASA | National Aeronautics and Space Administration |
| NB | north bound |
| NCY | New Conservation Yard |
| NDMA | n-nitrosodimenthylamine |
| NEPA | National Environmental Policy Act |
| NHPA | National Historic Preservation Act |
| $NO_2$ | nitrogen dioxide |
| NOI | Notice of Intent |
| NOx | oxides of nitrogen |
| NPDES | National Pollutant Discharge Elimination System |
| NPS | U.S. National Park Service |
| NRCS | Natural Resource Conservation Service |
| NRHP | National Register of Historic Places |
| NSGW | near-surface groundwater |
| NT | non-treatable (technology) |
| O&M | operation and maintenance |
| ODC | ozone-depleting chemical |
| PAH | polycyclic aromatic hydrocarbon |
| PCB | polychlorinated biphenyl |
| PCE | tetrachloroethene |
| PeMS | Performance Measurement System (Caltrans) |
| PERP | Portable Equipment Registration Program |
| PFC | perfluorocarbon |
| pg/g | picograms per gram |
| PHT | peak hour trips |
| $PM_{2.5}$ | particulate matter having an aerodynamic equivalent diameter of 2.5 microns or less |
| $PM_{10}$ | particulate matter having an aerodynamic equivalent diameter of 10 microns or less |
| PRA | preliminary remediation area |
| RCNM | Roadway Construction Noise Model |
| RCRA | Resource Conservation and Recovery Act |
| RI | Remedial Investigation |

| | |
|---|---|
| ROD | Record of Decision |
| ROI | region of influence |
| RWQCB | Regional Water Quality Control Board |
| SAIC | Science Applications International Corporation |
| SB | south bound |
| SCAB | South Coast Air Basin |
| SCAQMD | South Coast Air Quality Management District |
| SCCAB | South Central Coast Air Basin |
| SCCIC | South Central Coastal Information Center |
| SCE | Southern California Edison |
| $SF_6$ | sulfur hexafluoride |
| SHPO | State Historic Preservation Officer |
| SIP | state implementation plan |
| SJVAB | San Joaquin Valley Air Basin |
| SJVAPCD | San Joaquin Valley Air Pollution Control District |
| SMOU | Surficial Media Operable Unit |
| $SO_2$ | sulfur dioxide |
| SOx | oxides of sulfur |
| SPA | Storable Propellant Area |
| SR | State Route |
| SRAM | Standardized Risk Assessment Methodology |
| SSC | Species of Special Concern |
| SSFL | Santa Susana Field Laboratory |
| STP | Sewage Treatment Plant |
| SVE | soil vapor extraction |
| SVOC | semivolatile organic compound |
| SWPPP | Stormwater Pollution Prevention Plan |
| TCDD | 2,3,7,8-tetrachloro-dibenzo-p-dioxin |
| TCE | trichloroethene |
| TCP | traditional cultural property |
| TCR | The Climate Registry |
| TEQ | toxicity equivalent |
| TMDL | total maximum daily load |
| TPH | total petroleum hydrocarbons |
| TSCA | Toxic Substances Control Act |
| TSD | treatment, storage, and disposal |
| TT | treatable technology |
| U.S. | United States |
| USACE | U.S. Army Corps of Engineers |

| | |
|---|---|
| USAF | U.S. Air Force |
| USDA | U.S. Department of Agriculture |
| USFWS | U.S. Fish and Wildlife Service |
| UST | underground storage tank |
| V/C | volume to capacity |
| VCAPCD | Ventura County Air Pollution Control District |
| VOC | volatile organic compound |
| WB | west bound |
| WR | Weitze Research |
| $yd^3$ | cubic yard |
| ZVI | zero valent iron |

SECTION 1

# Purpose and Need

The National Aeronautics and Space Administration (NASA) proposes to demolish existing structures and to remediate groundwater and soil (the "Proposed Action") on the federally owned property that NASA administers at Santa Susana Field Laboratory (SSFL) in Ventura County, California.

This Environmental Impact Statement (EIS) provides an evaluation of potential environmental impacts from the proposed cleanup and demolition activities to support the disposition of the NASA-administered portion of SSFL and of NASA's obligation to remediate the environment.

NASA is the federal lead agency. The purpose of this EIS is to inform the NASA decision makers, the regulating agencies, and the public about likely environmental consequences associated with the demolition of SSFL site structures and soil and groundwater cleanup activities within a portion of Area I (former Liquid Oxygen [LOX] Plant) and all of Area II of SSFL. Section 2 provides descriptions and locations of the demolition and soil and groundwater cleanup activities.

NASA has prepared this EIS in accordance with the National Environmental Policy Act of 1969 (NEPA), as amended; the implementing regulations issued by the Council on Environmental Quality (CEQ) (40 *Code of Federal Regulations* [CFR] Parts 1500-1508); guidance letter submitted by the CEQ dated June 19, 2012 (Appendix A), and the NASA Procedural Requirements 8580.1 (NASA, 2001; 2008a) for Implementing NEPA (14 CFR 1216.1 and 1216.3). As permitted by 36 CFR 800.8(c) of the National Historic Preservation Act (NHPA), NASA is using the EIS to comply with Section 106 of the NHPA in lieu of the procedures set forth in Sections 800.3 through 800.6.

## 1.1 Background

### 1.1.1 Historical Site Use

Prior to development, the land at the SSFL was used for ranching. In 1948, North American Aviation (NAA), a predecessor to Rockwell International Corporation, began using (by lease) what is now known as the northeastern portion, or Area I, of SSFL. The majority of SSFL was acquired with the purchase of the Silvernale property in 1954, and development of the western portion of SSFL began soon after. Since 1948, research, development, and testing of liquid-fueled rocket engines and associated components (such as pumps and valves) were the primary site activities at SSFL (Science Applications International Corporation [SAIC], 1994). The vast majority of rocket engine testing and ancillary support operations occurred from the 1950s through the early 1970s. Rockwell International and other predecessors to The Boeing Company (Boeing) conducted these operations in Areas I and III in support of various government space programs and in Area II on behalf of the United States (U.S.) Air Force (USAF) and then of NASA. NASA gradually discontinued test activities beginning in the 1980s and conducted its final tests in 2006. Boeing has performed operation and maintenance activities on facilities within the NASA portion of SSFL since 1996.

Figure 1.1-1 shows the NASA-administered areas and site locations. In Area II, rocket engine testing occurred at the four test stand areas constructed between 1954 and 1957. Figure 1.1-2 shows these four test stand areas (Alfa, Bravo, Coca, and Delta), which contain additional buildings for support activities and infrastructure. NASA has recommended the six remaining individual test stands, along with related nearby structures and features, as eligible for listing in the National Register of Historic Places (NRHP) based on the historical importance of the testing achievements completed at the site and the engineering and design of the structures. Section 4.3 provides more information regarding historic properties.

Engine testing at SSFL primarily used petroleum-based compounds as the "fuel" and LOX as the "oxidizer." Trichloroethene (TCE) was the primary solvent used for cleaning rocket engine components and for other cleaning purposes.

### 1.1.2 Property Administered by NASA

SSFL is at approximately 1,100 feet (ft) of elevation and 29 miles northwest of downtown Los Angeles, California, in the southeastern corner of Ventura County. SSFL occupies approximately 2,850 acres of hilly terrain and is owned in part by Boeing and in part by the U.S. Government. The land management is designated by Administrative Areas. NASA administers part of Area I and all of Area II (approximately 450 acres). Boeing owns the remainder of the SSFL property (Figure 1.1-1).

NAA established Rocketdyne as a separate division in 1955. In December 1958, Rocketdyne deeded some of the property to the USAF that operated as USAF Plant 57. In the 1970s, the General Services Administration (GSA) transferred custody and accountability from the USAF to NASA, and NASA currently administers both Area II and the LOX portion of Area I. From 1968 to 1976, Boeing acquired undeveloped land parcels to the south of SSFL with the intent of creating an unused zone between testing operations and areas outside the SSFL boundaries. In 1998, Boeing acquired additional undeveloped properties to the north of SSFL.

### 1.1.3 Site Characterization

NASA continues to conduct environmental sampling to characterize site conditions on its portion of SSFL, and has conducted such sampling for more than 20 years. The results of these studies indicate that primarily metals, dioxins, polychlorinated biphenyls, volatile organics including TCE, and semivolatile organics are present in the soils and upper groundwater, known as the Surficial Media Operable Unit (SMOU). Volatile organics, metals, and semivolatile organics also are present in the deeper groundwater, known as the Chatsworth Formation Operable Unit (CFOU).

NASA has documented contamination on the NASA-administered property in five remedial investigation (RI) reports for the CFOU and the SMOU. The RI reports include descriptions of the site characterization, along with human health and ecological risk assessments performed for the various sites on the NASA-administered property. Likewise, the data included in the RI reports describe the groundwater conditions, which are used to evaluate effective groundwater remedial technologies to meet cleanup levels consistent with potential future land uses. NASA participated in the development of the Standardized Risk Assessment Methodology (SRAM) (MWH, 2005), which, based on these characterizations, outlines various remedial approaches to implementing risk-based remedial protocols. Additional sampling to refine the extent of contamination based on Look-Up Table values[1] (http://www.dtsc-ssfl.com/files/lib_look-uptables/chemical/66073_06112013LUTand_cover.pdf) is detailed in site-specific field sampling plans. Groundwater treatability studies described in the Groundwater Interim Measures Work Plan (MWH, 2007a), which was submitted to the California Department of Toxic Substances Control (DTSC), currently are being evaluated and implemented.

### 1.1.4 Property Administration and Commitments

NASA’s Construction and Environmental Compliance and Restoration (CECR) Program includes funding demolition of facilities as part of NASA's Construction of Facilities Program, which strives to reduce operating costs, maintenance burdens, and utility costs to make more of NASA's funding available for missions. The CECR Program accomplishes this goal by eliminating inactive and obsolete facilities that no longer support NASA's mission.

Because the property and structures at SSFL are inactive, NASA decided the property and structures were no longer required to support its mission and, on September 14, 2009, NASA reported the property to the GSA as excess. GSA conditionally accepted NASA's report of excess pending NASA’s certification that remedial action necessary to protect human health and the environment with respect to hazardous substances on the property has been completed, or that the Governor concurs with the suitability of the property for transfer in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act, Section 120(h)(3)(C).

[1] Look-Up Table values were established by DTSC and would be used as the cleanup standards for soil for the various analytes. The Look-Up Table values were established on the basis of the DTSC background study and reasonably achievable method reporting limits by multiple laboratories.

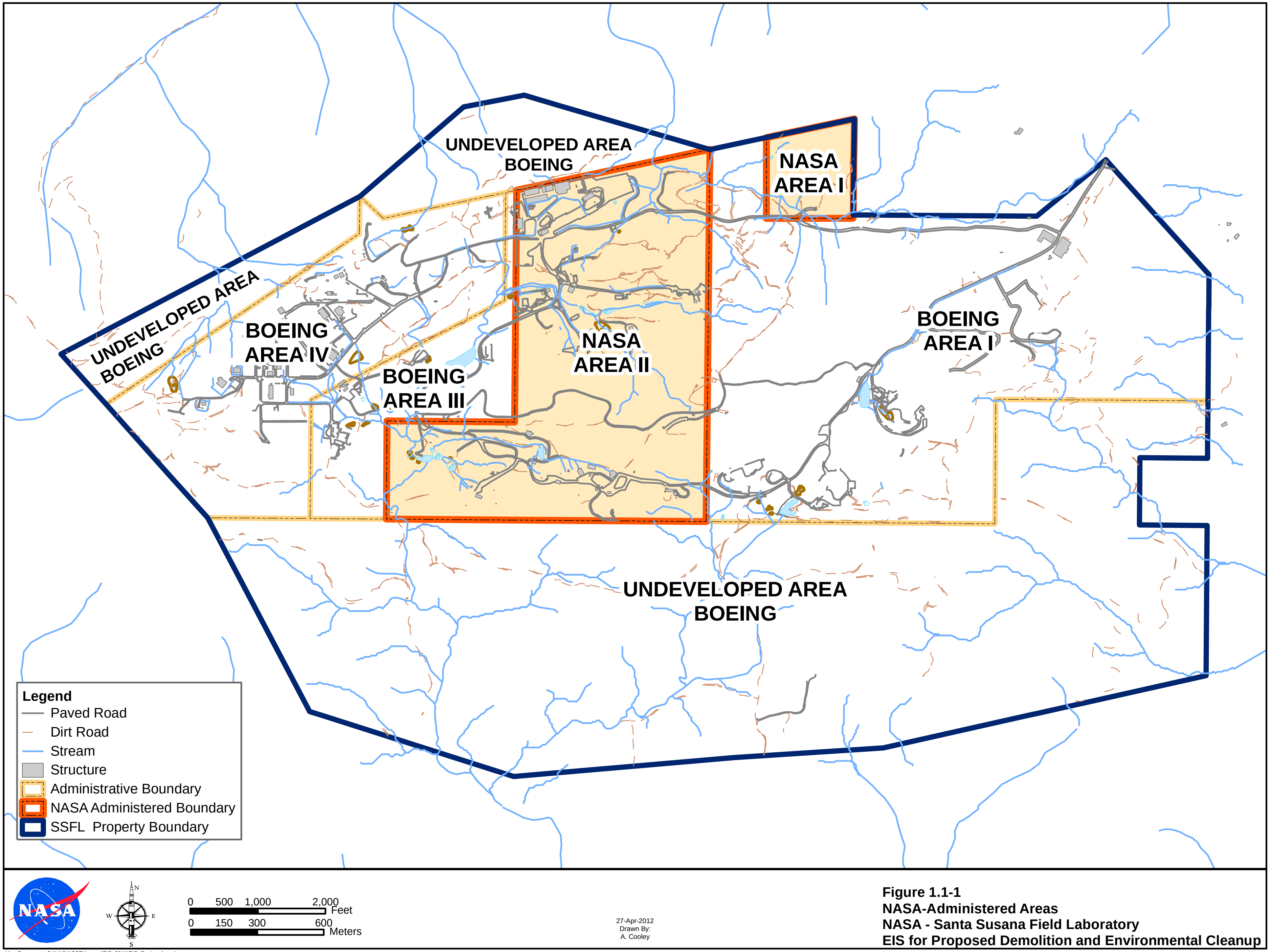


**Figure 1.1-1**
**NASA-Administered Areas**
**NASA - Santa Susana Field Laboratory**
**EIS for Proposed Demolition and Environmental Cleanup**

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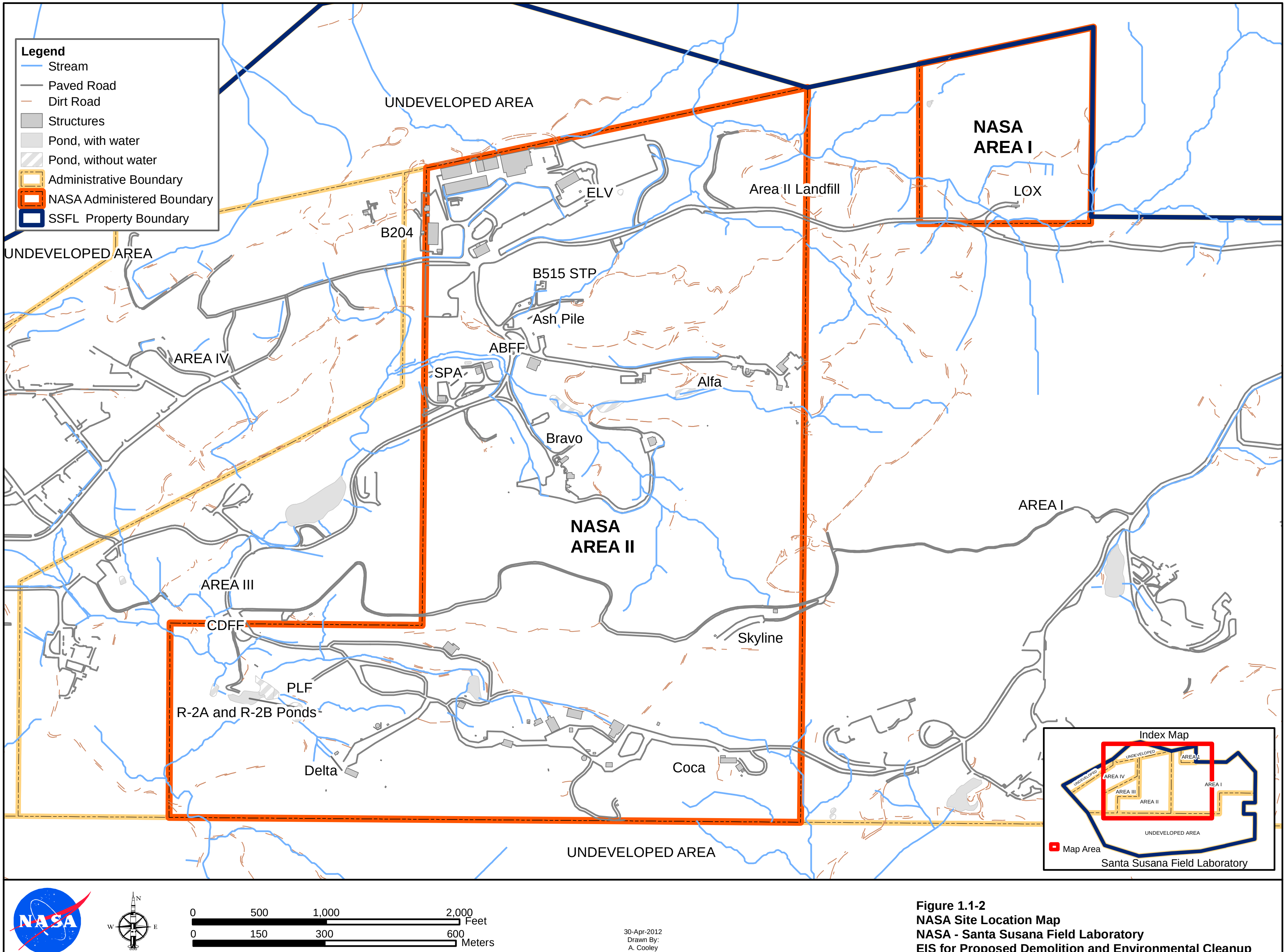


**Figure 1.1-2**
**NASA Site Location Map**
**NASA - Santa Susana Field Laboratory**
**EIS for Proposed Demolition and Environmental Cleanup**

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In August 2007, NASA, Boeing, the U.S. Department of Energy (DOE), and DTSC signed a Consent Order for Corrective Action (State of California DTSC Docket No. P3-07/08-003, 2007; hereby referred to as "2007 Consent Order") that addressed the cleanup of soils and groundwater at SSFL (California Environmental Protection Agency [Cal/EPA] DTSC, 2007). The 2007 Consent Order identified activities for the cleanup of soil, groundwater, and surface water at SSFL. In 2010, NASA and DTSC executed an Agreement in Principle for the soil cleanup.

Subsequently, on December 6, 2010, NASA and DTSC executed an Administrative Order on Consent for Remedial Action (AOC) (State of California DTSC Docket No. HAS-CO_10/11-038, 2010) that stipulates specific remedial requirements, including the characterization and cleanup of soil contamination on the NASA-administered areas of SSFL to Look-Up Table values (Cal/EPA DTSC, 2010). The 2010 AOC also requires that NASA complete a federal environmental review pursuant to NEPA of the impacts of implementing the soil and groundwater remedial activities. The cleanup of groundwater beneath SSFL and of surface water is not stipulated in the 2010 AOC. Therefore, per the 2007 Consent Order, groundwater and surface water data will be evaluated in accordance with the SRAM (MWH, 2005). On the basis of the results of the RIs, NASA is considering various remedial approaches that meet the NEPA requirement to evaluate a reasonable and feasible range of remedial technologies to meet the requirements of the Proposed Action.

In addition to the DTSC orders, in December 2009, the Regional Water Quality Control Board issued an order to Boeing to improve the quality of stormwater discharges by removing contaminated sediments associated with two outfalls. Stormwater from NASA-administered property exits SSFL through one of these outfalls.

## 1.2 Purpose and Need for Action

The purpose of the Proposed Action is to remediate the environment to a level that meets NASA's environmental cleanup responsibilities and to undertake the demolition actions necessary to support both remediation and property disposition of the NASA-administered portion of SSFL.

Contamination is known to exist at NASA's SSFL property because of previous mission activities, and NASA has declared the property excess to its mission needs. Therefore, the Proposed Action is needed to protect human health and the environment, to meet the requirements of the 2007 Consent Order and AOC by the completion date of 2017, to reduce ongoing maintenance costs, and to prepare the property for disposition.

Meeting this project purpose and these project needs would allow NASA to support property disposition safely, efficiently, and responsibly, consistent with the NASA CECR Program.

## 1.3 Scope of the Analysis

NASA has prepared this EIS in accordance with NEPA, the CEQ implementing regulations (40 CFR 1500-1508), and the NASA Procedural Requirements for Implementing NEPA, and as a requirement in the 2010 AOC. The scope of this EIS includes the potential environmental impacts of the proposed demolition and remedial action at the NASA-administered portion of SSFL. The purpose of the EIS is to inform NASA decision makers of the potential impacts through a complete and objective analysis. This analysis considers a Proposed Action that would meet the project purpose and need and a No Action Alternative, as well as a range of soil and groundwater remedial technologies that could meet the cleanup levels at the site. This project scope provides the decision makers with a comparative analysis by which to make a fully informed decision.

The GSA will conduct a separate environmental review under NEPA for the action of transferring the land out of NASA stewardship. The options could include reuse or redevelopment of the property under separate local, state, or private ownership. NASA and the GSA are coordinating during the preparation of the two environmental documents.

DTSC is preparing a separate Environmental Impact Report (EIR) under the California Environmental Quality Act, which requires that state agencies give major consideration, when regulating public and private activities, to preventing environmental degradation and to identifying environmentally superior mitigations and alternatives, when possible. This state-led environmental review will be documented in an EIR, which must identify the potentially significant environmental effects of a project and environmentally preferable alternatives to implementing the project. The EIR also indicates the manner in which significant effects could be mitigated or avoided. DTSC will analyze the potential environmental effects of environmental cleanup activities occurring SSFL-wide by NASA, Boeing, and DOE. NASA and DTSC have coordinated during these processes to maintain consistency pertaining to the analysis of the NASA-administered demolition and remedial activities. Cumulative effects of the proposed Boeing, DOE, and NASA demolition and remedial activities at SSFL would be considered. The DTSC EIR is likely to be prepared following publication of NASA's EIS, and could incorporate some of NASA's EIS analysis. A programmatic EIR will be developed that evaluates the remedial activities that could be conducted at SSFL by NASA, Boeing, and DOE, as well as project-specific EIRs that evaluate the localized remedial activities.

## 1.4 Decision to be Made

This EIS informs NASA decision makers, regulating agencies, and the public of the potential environmental consequences of the proposed demolition of SSFL buildings and structures and the proposed technologies for groundwater and soil remediation, as implemented through the Proposed Action. This EIS analyzes a range of remedial technologies that might be implemented to achieve the proposed groundwater and soil remedial goals. NASA will use the EIS analysis to consider the potential environmental, economic, and social impacts from the Proposed Action. On the basis of the EIS findings, NASA will issue a Record of Decision (ROD) documenting the findings and NASA's decisions.

SECTION 2

# Description of Proposed Action and Alternatives

This section describes the Proposed Action for implementing the proposed demolition and the soil and groundwater environmental remediation and the No Action Alternatives of both demolition and environmental cleanup. This section also includes a description of other alternatives and resource areas that were considered but removed from further consideration.

## 2.1 Project Location and Study Area

SSFL is approximately 29 miles northwest of downtown Los Angeles, California, in the southeastern corner of Ventura County, and occupies approximately 2,850 acres of hilly terrain with approximately 1,100 feet (ft) of topographic relief near the crest of the Simi Hills. The study area analyzed in this EIS is the NASA-administered property in Areas I and II at SSFL. Figure 2.1-1 shows SSFL's location and property boundaries, including the approximately 450 acres that compose the NASA-administered project site analyzed in this EIS.

## 2.2 Description of Proposed Action–Demolition, Soil Cleanup to Background Levels, and Groundwater Cleanup

The Proposed Action evaluated in this EIS is to demolish existing structures and to remediate soil and groundwater contamination on the NASA-administered property of SSFL, as well as maintain the office and warehouse square footage per the Office of Management and Budget Memorandum dated March 14, 2013 (http://www.whitehouse.gov/sites/default/files/omb/financial/memos/implementation-of-freeze-the-footprint-guidance.pdf). Sections 2.2.1 through 2.2.3 describe the specific project components of these activities.

The demolition and soil and groundwater cleanup methods to be used have been evaluated in accordance with federal, state, and local regulations relevant to each environmental resource area analyzed in this EIS. Environmental resources make up the physical, social, and cultural issues (for example, biological resources and environmental justice) that potentially could affect or be affected by the Proposed Actions analyzed in this EIS. Appendix B summarizes the regulations pertaining to the environmental resources in the area.

Section 4 evaluates the potential impacts of the proposed demolition of structures and environmental cleanup activities within the project area necessary to meet the Look-Up Table values. Potential impacts from the demolition of all structures within the NASA-administered areas are evaluated to provide the most reasonably conservative assessment of impacts.

### 2.2.1 Proposed Demolition Activities

This subsection lists the buildings and structures being considered for demolition, the approach and activities associated with the demolition process, and the methods for handling the waste generated by the demolitions. Structures not included in the demolition component of the Proposed Action (and therefore not evaluated in this EIS) include the following:

- Utility equipment needed to provide electrical service such as poles, lines, and substations (retired equipment would be considered for demolition)
- Stormwater management infrastructure, such as groundwater extraction and treatment system (GETS) pipeline infrastructure
- Remedial infrastructure, such as retention basins, wells, or pump-and-treat systems
- Roadways needed to gain access to other areas within SSFL that might remain in place
- Security fencing

#### 2.2.1.1 Structures Evaluated for Demolition

This subsection discusses the buildings and structures considered for demolition and removal, the potential content of these buildings and structures, and the demolition plan and schedule. Dismantled components of the demolished structures would be contained, as appropriate, and transported for offsite disposal. All buildings and structures on the NASA-administered property at SSFL are proposed for demolition, except for the structures listed in Section 2.2.1. Therefore, this EIS evaluates the broadest level of potential impacts.

The structures that would be demolished or dismantled as a part of this action include test stands as well as ancillary structures, which have been used since the 1950s for rocket engine testing in the Alfa, Bravo, Coca, and Delta Test Areas of SSFL that could include the following:

- Aboveground and subsurface structures
- Building foundations
- Utility poles
- Piping
- Administrative and operations buildings
- Water tanks
- Aboveground and belowground storage tanks
- Observation lookouts, roadways, and drainageways

Structures considered for demolition are listed in Table 2.2-1 by area. This list includes structures that NASA currently does not need or use and are considered excess. Corresponding to the areas identified in Table 2.2-1, Figure 2.2-1 shows the locations of the structures proposed for demolition as part of the Proposed Action and indicates the structures that are eligible for listing in the National Register of Historic Properties (NRHP).

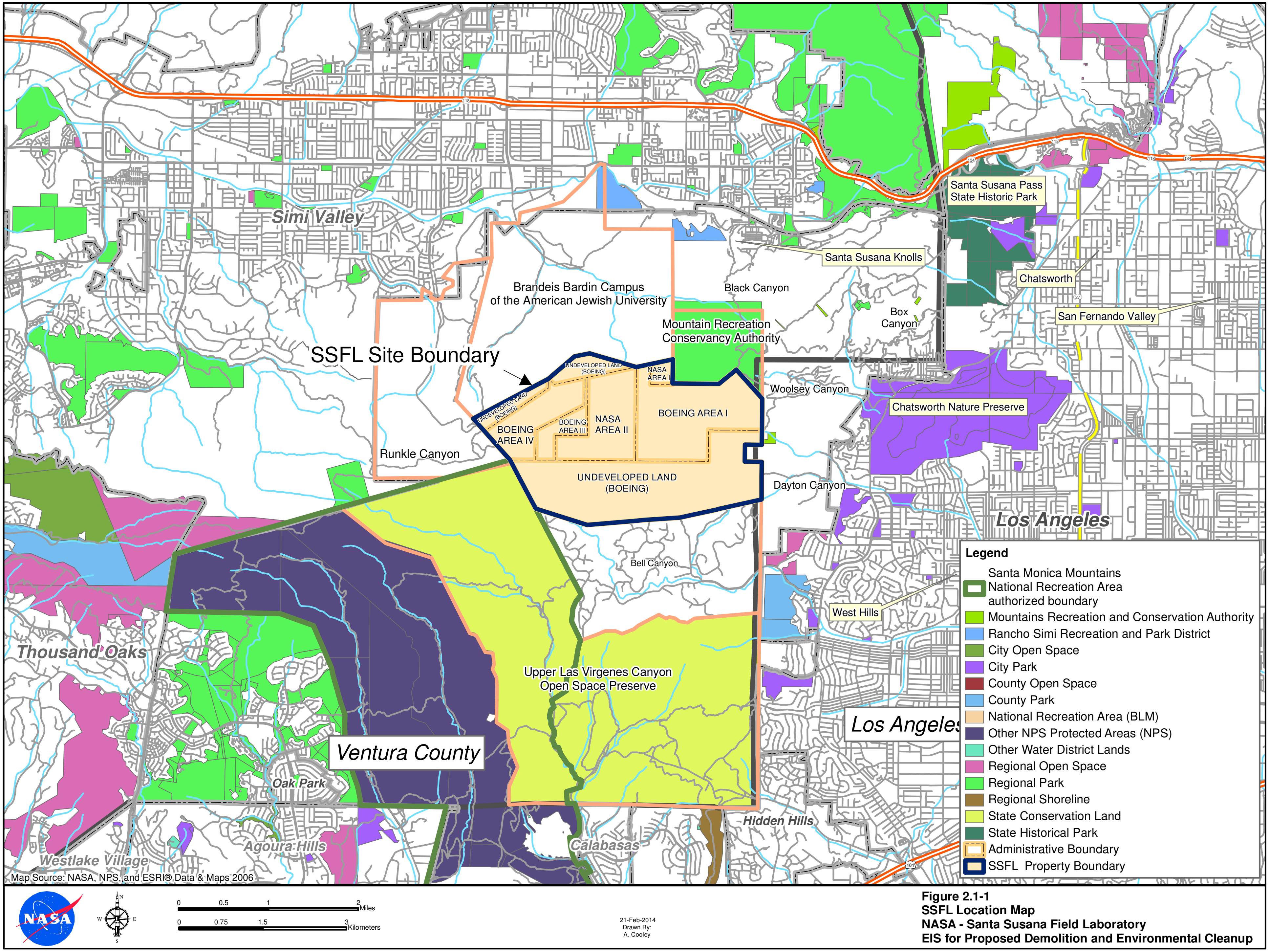
#### 2.2.1.2 Pre-demolition Activities

Prior to demolition, NASA would characterize nonhazardous and hazardous wastes in accordance with the framework established by applicable federal, state, and local regulations. NASA would coordinate these activities with the Department of Toxic Substances Control (DTSC) and the Ventura County Environmental Health Division, Certified Unified Program Agencies, which is the local entity responsible for oversight of the hazardous waste generator program.

NASA prepared and submitted to DTSC the *Standard Operating Procedures: Building Demolition Debris Characterization and Management for Santa Susana Field Laboratory* (NASA, 2011a). This standard operating procedure provides building surveys, a schedule, and procedures for sampling and characterizing NASA's remaining buildings to evaluate whether they are contaminated and to assess appropriate handling methods for managing and disposing of demolition debris.

NASA would inspect the area around each building for flaking paint, soil staining, or other conditions that could affect the potential remediation or demolition of the building. Structural components would be contained and asbestos-containing material and lead from non-metal components would be removed prior to demolition or deconstruction. Recyclable material, including metal components, would be separated from materials requiring hazardous or nonhazardous landfill disposal.

Active utility infrastructure connected to structures targeted for demolition or in areas anticipated for ground disturbance would be identified and rerouted before site work occurred. These include both aboveground and underground conduits and piping. Rerouting prior to site work would maintain uninterrupted service to electricity, natural gas, communications, potable water supply, and sewer service.




21-Feb-2014
Drawn By:
A. Cooley

**Figure 2.1-1**
**SSFL Location Map**
**NASA - Santa Susana Field Laboratory**
**EIS for Proposed Demolition and Environmental Cleanup**

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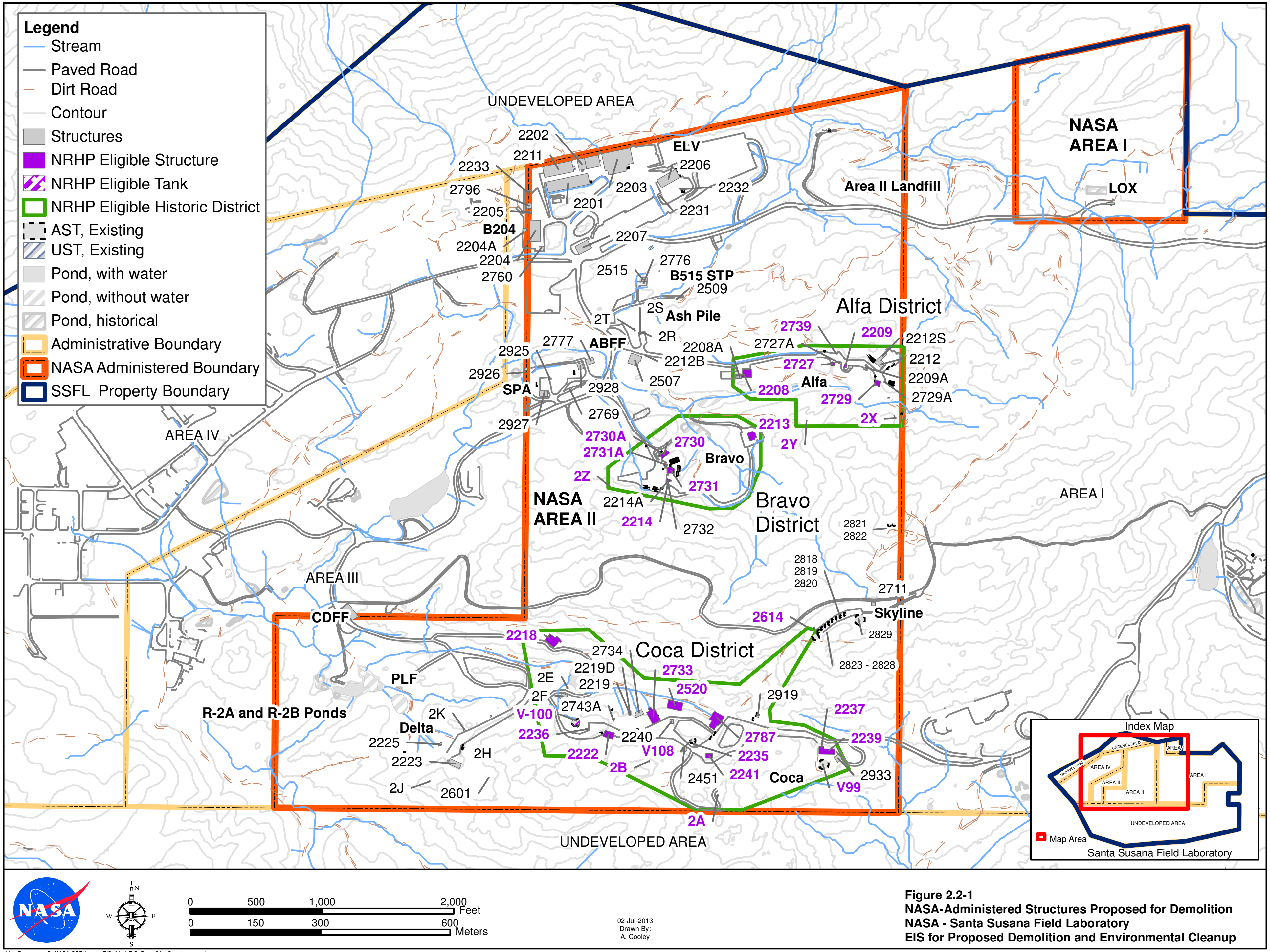


**Figure 2.2-1**
**NASA-Administered Structures Proposed for Demolition**
**NASA - Santa Susana Field Laboratory**
**EIS for Proposed Demolition and Environmental Cleanup**

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TABLE 2.2-1
**NASA-Administered Structures Proposed for Demolition and their NRHP and Biological Considerations**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Property No. | Property Name | Considerations |
|---|---|---|
| ***Alfa Area*** | | |
| 2208 | Alfa Control House | Individually NRHP-eligible; Contributes to NRHP-eligible district |
| 2208A | Alfa CC Engineering Trailer | Does not contribute to NRHP-eligible district |
| 2209 | Alfa Terminal House | Contributes to NRHP-eligible district |
| 2209A | Alfa 2 Electrical Control Station Shack | Does not contribute to NRHP-eligible district |
| 2212 | Alfa Pretest Shop | Does not contribute to NRHP-eligible district |
| 2212S | Alfa Pretest Extension | Does not contribute to NRHP-eligible district |
| 2212B | Alfa Old Guard Shack | Does not contribute to NRHP-eligible district |
| 2507 | Alfa/Bravo Fuel Farm | Does not contribute to NRHP-eligible district |
| 2727 | Alfa I Test Stand | Individually NRHP-eligible; Contributes to NRHP-eligible district; Potential for bird nests; bat roosts |
| 2727A | Alfa I Electric Control Station Shack | Contributes to NRHP-eligible district |
| 2729 | Alfa III Test Stand | Individually NRHP-eligible; Contributes to NRHP-eligible district; Potential for bird nests; bat roosts |
| 2729A | Alfa III Electric Control Station Shack | Contributes to NRHP-eligible district |
| 2739 | Standtalker Shack | Contributes to NRHP-eligible district |
| 2R | Alfa/Bravo GHe Comp. Shelter-1 | Does not contribute to NRHP-eligible district |
| 2S | Alfa/Bravo GHe Comp. Shelter-2 | Does not contribute to NRHP-eligible district |
| 2T | $GN_2$ Cascade Storage Building | Does not contribute to NRHP-eligible district |
| 2X | Alfa Observation Structure (Pill Box) | Contributes to NRHP-eligible district |
| 2Y | Alfa Observation Structure (Pill Box) | Contributes to NRHP-eligible district |
| IO200087 | Road to Test Facility (Alfa) | Does not contribute to NRHP-eligible district |
| IO200099 | Propellant Service Pipeline from 507 Fuel Farm | Does not contribute to NRHP-eligible district |
| IO200100 | LOX Line Alfa | Does not contribute to NRHP-eligible district |
| IO200111 | Area II Traffic Signals (Alfa) | Does not contribute to NRHP-eligible district |
| IO200487 | Pole Platform Electrical Substation (Alfa) | Does not contribute to NRHP-eligible district |
| | Alfa Landscape/Spillway | Contributes to NRHP-eligible district |
| ***Ash Pile and STP Area*** | | |
| 2515 | STP Facility | None |
| 2776 | STP Building | None |
| ***Bravo Area*** | | |
| 2213 | Bravo Control House | Individually NRHP-eligible; Contributes to NRHP-eligible district |
| 2214 | Bravo Terminal House | Contributes to NRHP-eligible district |
| 2214A | Bravo III Electrical Control Station Shack | Does not contribute to NHRP-eligible district |
| 2730 | Bravo I Test Stand | Individually NRHP-eligible; Contributes to NRHP-eligible district; Potential for bird nests; bat roosts |

TABLE 2.2-1
**NASA-Administered Structures Proposed for Demolition and their NRHP and Biological Considerations**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Property No. | Property Name | Considerations |
|---|---|---|
| 2730A | Bravo I Electric Control Station | Contributes to NRHP-eligible district |
| 2731 | Bravo II Test Stand | Individually NRHP-eligible; Contributes to NRHP-eligible district; Potential for bird nests; bat roosts |
| 2731A | Bravo II Electric Control Station | Contributes to NRHP-eligible district |
| 2732 | Bravo Storage | Does not contribute to NRHP-eligible district |
| 2Z | Bravo Observation Structure (Pill Box) | Contributes to NRHP-eligible district |
| Bravo-1 | Grand Stands in Bravo Area | Does not contribute to NRHP-eligible district |
| IO200115 | Reclaim Water Distribution System (Opposite SPA) | Does not contribute to NRHP-eligible district |
| IO200310 | Exterior Lighting Bravo Area | Does not contribute to NRHP-eligible district |
| | Bravo Landscape/Spillway | Contributes to NRHP-eligible district |
| ***Coca Area*** | | |
| 2218 | Coca Control Center | Individually NRHP-eligible; Contributes to NRHP-eligible district |
| 2219 | Coca Terminal House | Does not contribute to NRHP-eligible district |
| 2219D | Coca T-House, "D" | Does not contribute to NRHP-eligible district |
| 2222 | Coca Pre-Test Building | Contributes to NRHP-eligible district |
| 2235 | Coca Electrical Control Station (LOX) | Contributes to NRHP-eligible district |
| 2236 | Coca Electrical Control Station (LH2) | Contributes to NRHP-eligible district |
| 2237 | Coca GH2 Compressor Building | Contributes to NRHP-eligible district |
| 2239 | Coca GH2 Compressor Building | Contributes to NRHP-eligible district |
| 2240 | Coca Pump House | Does not contribute to NRHP-eligible district |
| 2241 | Coca Deflector W. Pump House | Contributes to NRHP-eligible district |
| 2451 | Coca Carousal Storage | Does not contribute to NRHP-eligible district |
| 2520 | Coca High Pressure $GH_2$ and $GN_2$ Vault | Contributes to NRHP-eligible district |
| 2614 | Coca IV Observation Structure (Pill Box) | Contributes to NRHP-eligible district |
| 2733 | Coca I Test Stand | Individually NRHP-eligible; Contributes to NRHP-eligible district; Potential for bird nests; bat roosts |
| 2734 | Coca Old Coca II Test Stand | Potential for bird nests; bat roosts |
| 2743A | Concrete Shed (Coca II Test Stand) | Does not contribute to NRHP-eligible district |
| 2787 | Coca IV Test Stand | Individually NRHP-eligible; Contributes to NRHP-eligible district; Potential for bird nests; bat roosts |
| 2919 | Coca IV Compressor Shelter | Does not contribute to NRHP-eligible district |
| 2933 | Compressor Station–Shelter | Does not contribute to NRHP-eligible district |
| V99 | Coca GH2 Vessel | Contributes to NRHP-eligible district |
| V100 | Coca LH2 Vessel #1 | Contributes to NRHP-eligible district |
| V108 | Coca LOX Vessel #1 | Contributes to NRHP-eligible district |
| 2A | Coca A3 Pill Box | Contributes to NRHP-eligible district |

TABLE 2.2-1
**NASA-Administered Structures Proposed for Demolition and their NRHP and Biological Considerations**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Property No. | Property Name | Considerations |
|---|---|---|
| 2B | Coca Old Pill Box | Contributes to NRHP-eligible district |
| 2E | Coca Electrical Control Building Beside Pond | Does not contribute to NRHP-eligible district |
| 2F | Coca Ruins (Bulkhead Test Facility) Foundation | Does not contribute to NRHP-eligible district |
| IO200114 | Boundary Fence (Coca Area) | Does not contribute to NRHP-eligible district |
| IO200348 | Compressor Station Drainage Control (Near 239) | Does not contribute to NRHP-eligible district |
| IO200442 | 42-inch Water Line (Hillside Behind 919) | Does not contribute to NRHP-eligible district |
| IO504001 | Water Spillway from Coca Test Stand (Underneath) | Does not contribute to NRHP-eligible district |
| IO504006 | Coca Exterior Lighting | Does not contribute to NRHP-eligible district |
| IO504729 | Coca LH2 Storage Site Preparations | Does not contribute to NRHP-eligible district |
| IO504734 | Bottle Tank Area (Across from Coca 1 Test Stand) | Does not contribute to NRHP-eligible district |
| | Coca Cable Tunnel | Contributes to NRHP-eligible district |
| | Coca Landscape/Spillway | Contributes to NRHP-eligible district |
| ***Delta Area*** | | |
| 2223 | Delta Tool Engineering Storage | None |
| 2225 | Delta Terminal House | None |
| 2601 | Delta Pill Box #3 | None |
| 2H | Delta Pill Box #1 | None |
| 2J | Delta Pill Box #2 | None |
| 2K | Delta T-House | None |
| IO200082 | Concrete Foundation for Delta II Test Stand | None |
| IO200102 | Demolished LN2 Building Slab and Piping (508) | None |
| IO200171 | Delta Water Reservoir (R1-A Pond) | None |
| IO200316 | Hydrogen Loading Pad (Delta) Near 225 | None |
| IO200320 | Retaining Wall H2 Pad Delta | None |
| | Delta Landscape/Spillway | None |
| ***ELV and Maintenance Area*** | | |
| 2201 | Engineering Offices | None |
| 2202 | LEOS storage | None |
| 2203 | Lasers Lab Facility | None |
| 2204 | Maintenance Building | None |
| 2204A | Shed Behind 204 | None |
| 2205 | Maintenance Lunch Room | None |
| 2206 | ELV Final Assembly Building | None |
| 2207 | Protective Services Building | None |
| 2211 | Furniture Storage | None |

TABLE 2.2-1
**NASA-Administered Structures Proposed for Demolition and their NRHP and Biological Considerations**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Property No. | Property Name | Considerations |
|---|---|---|
| 2231 | Environmental Equipment Storage | None |
| 2232 | LOX Tank Control Building/Liquid Nitrogen Shelter | None |
| 2233 | Maintenance Paint Storage | None |
| 2509 | Electrical Substation | None |
| 2760 | Maintenance Supply Shed | None |
| 2796 | Maintenance Paint Shop | None |
| IO200093 | Sewage Waste Pipelines (Lines through Area II) | None |
| IO200173 | Water Well 13 | None |
| IO200179 | Maintenance Yard Interior Fence (Between 206 and 203) | None |
| ***Skyline Area*** | | |
| 2711 | Radio Signal Boost Station | None |
| 2818 | Skyline Water Tank | None |
| 2819 | Skyline Water Tank | None |
| 2820 | Skyline Water Tank | None |
| 2821 | Skyline Water Tank | None |
| 2822 | Skyline Water Tank | None |
| 2823 | Skyline Water Tank | None |
| 2824 | Skyline Water Tank | None |
| 2825 | Skyline Water Tank | None |
| 2826 | Skyline Water Tank | None |
| 2827 | Skyline Water Tank | None |
| 2828 | Skyline Water Tank | None |
| 2829 | Skyline Water Tank | None |
| IO200170 | Water Line (Skyline) | None |
| IO200313 | Electrical Substation (Skyline) | None |
| ***SPA Area*** | | |
| 2769 | SPA Awning Shelter | None |
| 2777 | SPA Oxidizer Storage Shelter | None |
| 2925 | SPA Fuel Mix Shed awning | None |
| 2926 | Storage Shelter SPA | None |
| 2927 | SPA Storage Shelter For Fuels | None |
| 2928 | SPA Oxidizer Storage | None |
| IO504734 | Road–SPA | None |

TABLE 2.2-1
**NASA-Administered Structures Proposed for Demolition and their NRHP and Biological Considerations**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Property No. | Property Name | Considerations |
|---|---|---|
| ***Other Areas*** | | |
| IO200090 | Fence between Areas I and II | None |
| IO200092 | Electrical Distribution in Area II | None |
| IO200105 | $GN_2$ Distribution Lines (Roadside Area II/III Stop Sign | None |
| IO200106 | Fire Hydrants and Sprinklers (Various Locations Area II) | None |
| IO200108 | Area II Parking Areas | None |
| IO200109 | Area II External Lighting | None |
| IO200113 | Natural Gas Line | None |
| IO200479 | Land Area I | None |
| IO200480 | Land Area II | None |
| IO200481 | Truck Scales Road Area I (Boeing owns scales) | None |
| IO200484 | Water Main | None |
| IO200485 | Fire Protection Line | None |

Notes:
CC = (Alfa CC Engineering Trailer) Control Center
ELV = expendable launch vehicle
$GH_2$ = gaseous hydrogen
GHe = gaseous helium
$GN_2$ = gaseous nitrogen
LOX = liquid oxygen
LH2 = liquid hydrogen
LEOS = Laser and Electro-Optical System
None = no biological or NRHP considerations
SPA = Storable Propellant Area

### 2.2.1.3 Demolition Activities

Demolition would include the removal of structures up to 5 ft below grade. Demolition of structures in Area II is estimated to take up to 12 to 18 months to complete. Heavy equipment would include excavators, crawler cranes, all-terrain cranes, people-lifts, wheel loaders, 40-ton off-highway trucks, bulldozers, vacuum trucks, motor graders, and skid steer loaders. Smaller equipment would include compressors, pumps, lighting plants, and dust control equipment. The equipment would remain onsite for the duration of the demolition activities and be staged near ongoing demolition activities.

Tractor trailers, dump trucks, and flatbed trucks would be used over the course of the demolition activities to haul scrap metal, usable salvaged equipment, recyclable asphalts, and contaminated concrete to authorized facilities. Clean concrete could remain onsite to be used for grading materials.

Material and equipment staging would occur in the immediate vicinity of ongoing demolition. These designated areas primarily would be in areas that currently are parking lots or other relatively flat, paved areas adjacent to buildings or structures proposed for demolition. These areas currently are linked through the existing road system and are scattered throughout the NASA-administered property at SSFL. Other proposed staging and stockpiling areas that would have a minimal footprint on vegetation would be situated in non-paved areas.

#### 2.2.1.4 Waste Disposal and Recycling

NASA would characterize materials in buildings and structures proposed for demolition and removal in one of two ways. The first approach, in situ characterization, would be to characterize materials in place before demolition to assist in efforts to segregate nonhazardous from hazardous wastes or from incompatible wastes during demolition. In the second approach, contained materials would be characterized after demolition but before being loaded onto trucks or trailers for transport to an offsite approved construction waste facility. Material content, including the presence of mixed waste, which may include low-level radioactively contaminated industrial or research waste (although NASA operations did not use or generate radioactive waste) and Resource Conservation and Recovery Act (RCRA)-listed or characteristic hazardous waste, would be managed in compliance with applicable regulatory requirements. Waste contents would be confirmed via generator's knowledge or sampling before transfer offsite, and wastes would be managed in compliance with applicable regulatory requirements.

The handling and management of waste generated during demolitions would follow a hierarchical approach of source reduction, recycling, treatment, and disposal, to the extent possible. Nonhazardous scrap metals, concrete, and asphalt that were candidates for recycling would be separated from other materials and transported to a licensed recycling facility to reduce the amount of waste being disposed in landfills. Potentially reusable electronic and electrical devices and components (such as wiring) would be segregated for reconditioning. Offsite disposal would be used only for residual wastes that could not be reused, recycled, or treated. Soils that were tested as acceptable for use as backfill would remain onsite.

Depending on the types, sizes, volumes, hazardous contents, or ultimate destinations of materials, containment would be in drums, cubic yard ($yd^3$) boxes, roll-off bins, lined trucks or trailers, or tanks to prevent the release of materials or hazardous contents. Bins containing hazardous wastes would be kept securely closed, except when wastes were being transferred into or out of them, and would be transported for offsite disposal within the prescribed 90-day accumulation period (NASA, 2011a).

Up to an estimated 94,536 tons of test stands, buildings, and structures could be demolished and possibly hauled to the following facilities (other facilities might be used once demolition began) and identified for possible export, resale, disposal, or reuse:

- Materials for export would be transported to the Port of Los Angeles in San Pedro, California.
- Materials for resale would be transported to an equipment dealer in Los Angeles County, California.
- Hazardous concrete would be transported to Kettleman Hills Landfill in Kettleman City, California.
- Asphalt for reuse would be transported to a recycling firm in Simi Valley, California.

Table 2.2-2 summarizes the estimated number of haul trips by type of waste.

TABLE 2.2-2
**Proposed Demolition Hauling**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Material Type | Estimated Material Quantity (tons) | Estimated Total Haul Trips Required | Round Trips Required |
|---|---|---|---|
| Scrap Metal for Export | 8,250 | 330 | 660 |
| Equipment for Resale | 8,134 | 325 | 650 |
| Hazardous Concrete | 4,750 | 190 | 380 |
| Nonhazardous Concrete | 38,000 | 1,520 | 3,040 |
| Asphalt for Reuse | 35,000 | 1,400 | 2,800 |
| Construction and Demolition | 5,000 | 200 | 400 |

#### 2.2.1.5 Demolition Schedule

NASA would not begin demolition until completion of the federal environmental review processes and the National Historic Preservation Act consultation process. For the purpose of this analysis, demolition is anticipated to begin sometime in 2014 and is expected to last between 12 and 18 months. Demolition and transport activities would occur during daylight hours only, within the SSFL operation hours of 7 a.m. to 7 p.m.

### 2.2.2 Proposed Soil Remedial Activities

This subsection provides a discussion of the proposed soil remediation activities and the level of soil cleanup proposed under this action, as well as the potential remedial technologies that might be used to achieve the Look-Up Table values.

Figure 2.2-2 shows the general footprints of the proposed soil remediation areas under the Proposed Action. The soil depth that would require cleanup generally would be less than 5 ft, but could reach 20 ft in some areas. Where cleanup areas are separated from existing roadways, NASA would develop temporary access roads. Figure 2.2-2 shows where staging and stockpile areas might be located to minimize impacts to the surrounding environment. Specific locations would be identified in the Remedial Action Plan prior to remediation activities.

NASA might find that active utility infrastructure (such as gas or electricity) that is not removed during the demolition phase is located in areas expected to undergo ground disturbance or soil removal. Such infrastructure, including aboveground and underground conduits and piping, would be identified and rerouted before site work, as necessary. Utility services that could be retained without rerouting might simply be turned off for the duration of site work in coordination with the utility provider and service recipients.

#### 2.2.2.1 Cleanup of Soil to Background

Under the Proposed Action, NASA would remediate the soils on the NASA-administered property of SSFL to levels in a series of Look-Up Tables that have been or will be developed in the future by DTSC. DTSC provided a Look-Up Table on 11 June 2013 that lists the primary contaminants that were detected in the soil at SSFL. A second Look-Up Table is currently being developed that will address the remaining contaminants. The values in both the Look-Up Tables would be developed on the basis of local background values and method reporting limits that could be achieved by a laboratory for contaminants that do not naturally occur. Because it is not known yet if the alternative technical cleanup options (discussed later in this section) would be able to meet the Look-Up Table values, for the purposes of this EIS, impacts will be assessed against the action of excavation and offsite disposal of all of the soils remediated. Potential remedial technologies will be listed and evaluated for their impacts if they could be implemented. These technologies could result in greater or lesser impacts, compared to the excavation technology.

Soils would be sampled and characterized before transport to confirm soil content and to identify the appropriate handling and disposal facility. Cleanup of soils would not include the cleanup of volatile organic compounds (VOCs) found in the groundwater or the cleanup of VOCs emanating from contaminated groundwater that migrate into and through the saturated and unsaturated soil or bedrock beneath SSFL. This cleanup will be addressed in groundwater cleanup portion of the Proposed Action.

#### 2.2.2.2 Preliminary Remediation Areas

The soil areas required to be cleaned up to meet the 2010 Administrative Order on Consent for Remedial Action (AOC) (State of California DTSC Docket No. HAS-CO_10/11-038, 2010) are called preliminary remediation areas (PRAs). These areas are considered preliminary because DTSC finalized the final cleanup values in its June 2013 chemical Look-Up Table for the primary contaminants detected in the soil, and consequently, field investigation work has not been completed. In general, PRAs were evaluated by comparing the field data against screening values agreed to with DTSC. Table 2.2-3 provides a comparison of the screening values used to evaluate the PRAs compared to preliminary Look-Up Table values for the key contaminants of concern (COCs). The sample locations that have concentrations above the Look-Up Table values (also referred to as exceedances) were then mapped using geographic information system software tools.

TABLE 2.2-3
**SSFL AOC Soil Cleanup Values Comparison–April 2013**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Chemical Class | Parameter | Units | Look-Up Table Values | Cleanup Values Used for Soil Excavation Estimate |
|---|---|---|---|---|
| VOCs | Toluene | µg/kg | 5 | 2 |
| VOCs | Trichloroethene | µg/kg | 5 | 2 |
| PAHs | BaP Equivalent | µg/kg | 4.47 | 4 |
| PCBs | Aroclor-1254 (PCB Mixture) | µg/kg | 17 | 15 |
| PCBs | Aroclor-1260 (PCB Mixture) | µg/kg | 17 | 15 |
| Metals | Antimony | mg/kg | 0.86 | 0.738 |
| Metals | Arsenic | mg/kg | 46 | 38.7 |
| Metals | Cadmium | mg/kg | 0.7 | 0.579 |
| Metals | Lead | mg/kg | 49 | 42.15 |
| Metals | Silver | mg/kg | 0.2 | 0.138 |
| Metals | Zinc | mg/kg | 215 | 185 |
| Metals | Mercury | mg/kg | 0.13 | 0.0411 |
| Dioxins | 2,3,7,8-TCDD TEQ | pg/g | 0.912 | 0.844 |
| TPHs | EFH(c21-C30) | mg/kg | 5 [a] | 5 |

Notes:
BaP = benzo(a)pyrene
EFH = extractable fuel hydrocarbons
µg/kg = micrograms per kilogram
mg/kg = milligrams per kilogram
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
pg/g = picograms per gram
TCDD = 2,3,7,8-tetrachloro-dibenzo-p-dioxin
TEQ = toxicity equivalent
TPH = total petroleum hydrocarbon

[a] For locations where TPH is the sole contaminant, a cleanup strategy will be considered based on the findings of soil treatability study.

For the selection of cleanup technology options and EIS evaluations, the PRAs have been broken down into three categories:

1. Non-treatable Technology–meaning that excavation and disposal is the only available treatment alternative.
2. Treatable Technology–meaning that technical alternatives to excavation are possible. It still must be demonstrated that these technical alternatives can meet the 2010 AOC requirements.
3. Mixed–meaning a co-location of treatable and non-treatable soils that would require some excavation and some potential use of technical alternatives.

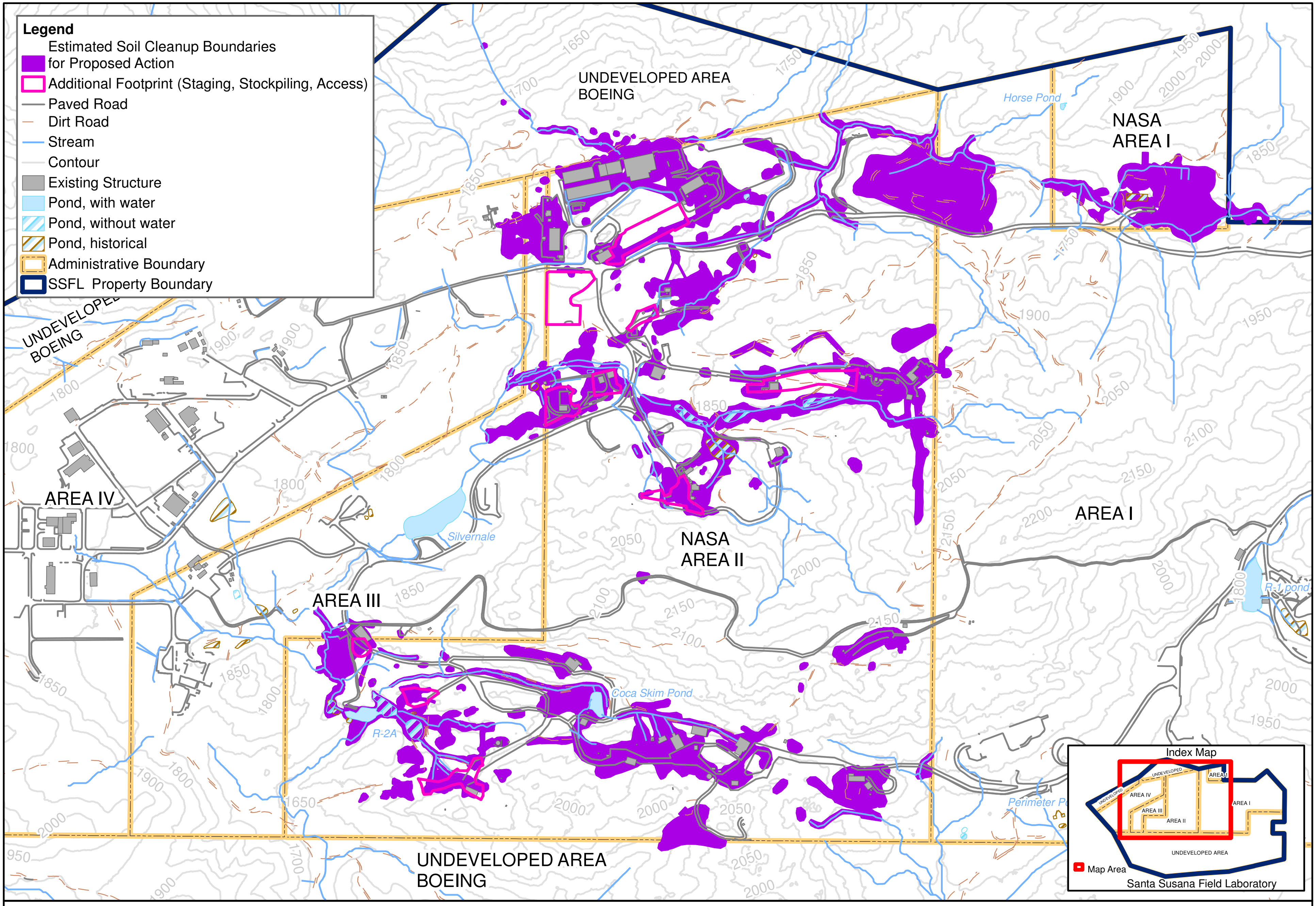


**Figure 2.2-2**
**Proposed Soil Remediation Area Under the Proposed Action**
**NASA - Santa Susana Field Laboratory**
**EIS for Proposed Demolition and Environmental Cleanup**

Map Document: O:\NASA\SSFL\maps\EIS_2011\EIS_ProposedCleanup.mxd

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Table 2.2-4 lists the COCs that apply to each group of PRAs.

TABLE 2.2-4
**Preliminary Remediation Area Categories and Associated Contaminants of Concern**
*NASA SSFL EIS for the Proposed Demolition and Environmental Cleanup*

| Category | Volume ($yd^3$) | Description |
|---|---|---|
| Non-treatable COCs (NT) | 320,000 | COCs such as dioxins, PCBs, metals, pesticides, and energetics. Although it is understood that some constituents identified as non-treatable can, in fact, be remediated with select technologies, this general parameter class has been assigned as non-treatable for the purpose of this document. As a remedial technology is selected for full-scale implementation in a specific area, each constituent would be evaluated for the feasibility of remediation. Additionally, where treatable COCs are found at depths less than or equivalent to non-treatable COCs, these areas would default to non-treatable areas and would be identified as NT/MX PRAs. The NT and NT/MX PRAs would require excavation and offsite disposal. |
| Treatable COCs (TT) | 180,000 | COCs such as PAHs, SVOCs, TPHs, and VOCs. These COCs are candidates for the technical alternative described in Sections 2.2.2. (soil) and 2.2.3. (groundwater). |
| Mixed COCs (MX) | Volumes included in NT and TT | In cases where both treatable and non-treatable COCs are co-located, with treatable COCs generally at deeper depths than the non-treatable COCs. The MX PRAs require excavation and disposal for the upper portion of the PRA containing NT or NT/MX COCs, and alternate technologies might be considered for the deeper portion of the PRA that contains TT COCs. |

Notes:
MX = mixed (technology)
NT = non-treatable technology
SVOC = semivolatile organic compound
TT = treatable technology

The estimated volume of non-treatable soil (including the non-treatable soil above the treatable soil in MX PRAs) at the NASA SSFL sites is approximately 320,000 $yd^3$ (the land surface area of PRAs is approximately 105 acres) and would require excavation and offsite disposal. For the soil identified as treatable, a remedial technology other than excavation and offsite disposal could be implemented. To confirm if a remedial technology successfully could be implemented on the treatable soil, field and laboratory-scale pilot testing would be conducted. If pilot testing indicated that remedial technologies could meet the Look-Up Table values, that technology would be considered for full-scale implementation for the treatable soils.

### 2.2.2.3 Soil Cleanup Technologies

Viable soil cleanup technologies were evaluated based on their effectiveness to clean up the specific contaminants at the site under the environmental conditions present at SSFL. To assess which remedial technologies could best suit the different types of contaminants present at SSFL, the type of remedial technology was first evaluated for ex situ and in situ general response actions that included solids, physical, chemical, biological, and thermal treatments. Technologies were eliminated if they were not in compliance with the 2010 AOC or were considered likely to be ineffective given the geologic setting or contaminant profile. Additionally, process options were eliminated if the implementation of a technology might have an undesirable effect on a specific environmental resource. Remedial process options that passed these criteria were further evaluated to identify the following:

- **Direct applicability to contaminants detected at SSFL, including VOCs, SVOCs, PAHs, TPHs, metals, PCBs, pesticides, and dioxins**–The best technology for application to specific COCs was evaluated. Process options were considered if the technology could degrade or destroy a target COC to below the Look-Up Table values, or if the technology would have the potential to successfully concentrate or segregate the non-treatable COCs.

- **Short- and long-term effectiveness**–A remedial process option alternative is considered effective if the process successfully can degrade or destroy COCs to levels that do not pose risks to human or ecological health without impairing the surroundings during implementation of the remediation or for future use of the site.
- **Implementability**–This criterion evaluates the technical feasibility, difficulties, and uncertainties associated with the construction and implementation of the remedial technology and availability of the services, materials, and equipment required to implement it to completion. In addition, the 2010 AOC requires the soil remediation activities to be complete by 2017; therefore, the timeframe required to meet Look-Up Table values for the soil COCs was a part of the implementability evaluation.

The soil cleanup methods considered in this EIS, therefore, represent a broad array of possible methods to achieve the Look-Up Table values as a part of the Proposed Action. This subsection describes each of the cleanup technologies, including the contaminant analyses group each technology addresses, the approach and application of technology implementation, and the general operational timeline. NASA might apply one or a combination of these technologies.

The 2010 AOC requirements specify excavation, but allow for treatment of soils onsite (referred to as **in situ** treatment) or for removing, treating, and replacing the remediated soils (referred to as **ex situ** treatment) as long as the Look-Up Table values are achieved.

**Excavation and Offsite Disposal**

This method would include the excavation, transport, and disposal of surface and subsurface contaminated soil. The types of construction equipment that would be used include backhoes, bulldozers, front-end loaders, and dump trucks to reduce the levels of contamination to the Look-Up Table Values. In areas of SSFL where oak trees or other protected species, habitat, or sensitive resources occur, NASA would work with the appropriate regulatory agency to develop an acceptable soil removal process to mitigate impacts to sensitive resources or habitat. This technology could be used to remove soil with multiple types of contaminants or to address contaminants not treatable by other technologies. Excavation also might be used as a back-up approach to other technologies used first in an attempt to avoid other environmental impacts, if the other technology did not achieve the Look-Up Table values. As such, this EIS considers excavation in each of the various analyses.

The soil would be excavated to bedrock in some areas where the top of bedrock is shallow. Bedrock would not be excavated. Rock outcrops generally would be retained. The estimated volume of soil requiring excavation under the Proposed Action would be approximately 500,000 $yd^3$. Confirmatory sampling would verify that the necessary contaminated soils were removed to meet the Look-Up Table values. After excavation was complete, no other monitoring would be required.

The removed soil would be stockpiled in multiple designated areas at SSFL and loaded onto dump trucks. Each stockpile would be limited to an area of 0.14 acre, with a height limit of 8 ft, per Ventura County Air Pollution Control District Rule 74.29 and South Coast Air Quality Management District (SCAQMD) Rule 1157.

Material and equipment staging would occur in the immediate vicinity of ongoing environmental cleanup activities. Figure 2.2-2 shows the possible locations for staging and stockpiling. These designated areas primarily would be in areas that currently are parking lots or other relatively flat, paved areas adjacent to proposed remediation areas.

Soil would be transported in bulk using dump trucks or similar vehicles, each with a capacity of approximately 19 $yd^3$. Hazardous materials would be placed in labeled U.S. Department of Transportation (DOT)-approved, 20-$yd^3$ transport bins or other DOT-approved containers. Table 2.2-5 shows possible landfills for offsite disposal of excavated soil. NASA has communicated with the landfills regarding capacity.

TABLE 2.2-5
**Possible Landfills for Offsite Disposal**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Source | State | Landfill | Remaining Landfill Capacity | Waste Type |
|---|---|---|---|---|
| http://www.calrecycle.ca.gov/SWFacilities/Directory/Search.aspx | CA | Chiquita Canyon | 29,300,000 cubic yards | Nonhazardous |
| http://www.calrecycle.ca.gov/SWFacilities/Directory/Search.aspx | CA | Lancaster | 14,514,648 cubic yards | Nonhazardous |
| http://www.calrecycle.ca.gov/SWFacilities/Directory/Search.aspx | CA | Antelope Valley | 20,400,000 cubic yards | Nonhazardous |
| http://ndep.nv.gov/docs_04/us_ecology_fs0105.pdf | NV | US Ecology Beatty | 974,120 cubic yards (Trench 11) plus an additional 400,000 cubic yards above ground at Trench 11 | Nonhazardous/hazardous |
| http://clark.cleanharbors.com/ttServerRoot/Download/12381_FINAL_Buttonwillow_CA_Facility_FS_030108.pdf | CA | Clean Harbors Buttonwillow | Permitted landfill capacity is in excess of **10 million cubic yards**; current constructed landfill capacity is **950,000 cubic yards** | • Nonhazardous, California hazardous, and RCRA hazardous landfill<br>• California hazardous and RCRA hazardous stabilization treatment<br>• California Hhzardous solidification<br>• California nonhazardous surface impoundment<br>• Naturally occuring radioactive materials and technically enhanced naturally occuring radioactive materials disposal up to 1,800 picocuries per gram total activity |
| | CA | Kettleman Hills | 5 million cubic yards (permitted expansion) | Radioactive or infectious waste, compressed gases, municipal refuse or garbage, explosives, and a variety of other reactive and extremely toxic wastes |
| http://clark.cleanharbors.com/ttServerRoot/Download/12577_FINAL_Grassy_Mt_UT_Facility_FS_010507.pdf | UT | Clean Harbors Grassy Mountain | • RCRA drum storage: 2,217 55-gallon containers<br>• PCB drum storage: 350 55-gallon-equivalent containers and two 3,000-gallon tanks<br>• **RCRA landfill capacity: 710,768 cubic yards**<br>• **Toxic Substances Control Act (TSCA) landfill capacity: 773,712 cubic yards**<br>• Bulk solids container capacity: 100 20-cubic-yard-equivalent containers<br>• Wide range of permitted waste codes<br>• PCB liquid storage for 63,982 gallons | PCB-contaminated soils, PCB electrical equipment, PCB contaminated debris, etc.; nonhazardous soils and other nonhazardous industrial wastes, asbestos wastes, hazardous waste for treatment of metals, plating wastes, acidic wastes, caustic wastes, hazardous debris, and non-PCB liquid wastes for solidification and landfill |
| http://www.hazardouswaste.utah.gov/Solid_Waste_Section/Docs/Annual_Reports/EnergySolutions_Annual_Report.pdf | UT | Energy Solutions Clive | 7,997,408 cubic yards | Low-level radioactive waste, NORM/NARM, PCB radioactive waste, asbestos-contaminated waste, mixed waste (i.e., both radioactive and hazardous), and 11e.(2) byproduct material |

TABLE 2.2-5
**Possible Landfills for Offsite Disposal**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Source | State | Landfill | Remaining Landfill Capacity | Waste Type |
|---|---|---|---|---|
| http://clark.cleanharbors.com/ttServerRoot/Download/34086_FINAL_Aragonite_UT_Facility_FS_082213.pdf | UT | Clean Harbors Aragonite | Drum storage capacity (RCRA/TSCA): 550,000 gallons (10,000 drums)<br>• Liquid tank storage capacity (RCRA/TSCA): 480,000 gallons<br>• Sludge tank storage capacity (nonflammable RCRA/TSCA): 30,000 gallons<br>• Bulk solid tank storage capacity (nonflammable RCRA/TSCA): 1,200 cubic yards; with the neighboring Clive facility, Aragonite can receive and store rail quantities and event business | Contaminated process wastewaters, inorganic cleaning solutions, oils, spent flammable solvents, organic and inorganic laboratory chemicals, paint residues, debris from toxic or reactive chemical cleanups, off-spec commercial products, compressed gas cylinders, household hazardous, U.S. Department of Justice-controlled substances, and infectious and medical waste |
| | ID | US Ecology Grand View | 10,890,258 cubic yards of permitted space and an additional 18,100,000 cubic yards of unpermitted space | Hazardous waste, nonhazardous industrial wastes, and low-activity radioactive material |

Soil loading and transport would occur concurrently with excavation activities and are planned to be completed by the end of 2017. Table 2.2-5 summarizes the estimated soil volumes and numbers of trucks required for transport of excavated soils to meet this timeframe under the Proposed Action. Table 2.2-6 also provides the estimated volume of backfill soil needed to restore excavated areas. The backfill material could be from an onsite or offsite source. The following potential offsite sources (others might be identified at the time of remediation) have been identified in the project vicinity in southern California:

- P. W. Gillibrand Company, located in Simi Valley, California
- Rindge Dam, located in Malibu Canyon, California
- Santa Paula Materials, Inc., located in Santa Paula, California
- Grimes Rock, Inc., located in Fillmore, California
- Tapo Rock and Sand Products, located in Simi Valley, California

TABLE 2.2-6
**Estimated Total Soil Volumes and Truck Requirements under the Proposed Action Excavation and Offsite Disposal Cleanup Technology**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Removal Parameters | Amounts | Round Trips Required |
|---|---|---|
| Removal Volume | 500,000 $yd^3$ | Not applicable |
| Trucks Required for Soil Removal | 26,441 | 52,882 |
| Truck Frequency for Soil Removal Hauling [a] | 53 trucks per day | 106 per day |
| Backfill Volume—1/3 of total volume | 167,000 $yd^3$ | Not applicable |
| Trucks Required for Backfill Hauling | 8,814 | 17,628 |
| Truck Frequency for Backfill Hauling [a] | 18 trucks per day | 36 per day |
| Hauling Duration | 23 months | Not applicable |
| Daily Material Handled [a] | 1,698 tons per day | Not applicable |

Note:
[a] Assumes completion of cleanup and soil hauling by the end of 2017.

The estimated volume of non-treatable soil (including the non-treatable soil above the treatable soil in MX PRAs) at the NASA SSFL sites is approximately 320,000 $yd^3$ and would require excavation and offsite disposal. For the soil identified as treatable, a remedial technology other than excavation and offsite disposal could be implemented. To confirm if a remedial technology could be implemented successfully on the treatable soil, pilot testing has been proposed. If pilot testing indicated that a remedial technology could meet the Look-Up Table values, that technology would be considered for full-scale implementation for the treatable soils. Following successful remediation treatment, the cleaned soil would be placed back into the excavations and used as backfill.

The majority of the treatable soils onsite are below 2 ft in the subsurface, with some deeper. Therefore, the upper 2 ft of soil, deeper at some locations, would be excavated within the remediation areas due to the mixture of contaminants that is present. The subsurface treatable soil then could be accessed for remediation once the shallow soils had been excavated. The remaining minority areas of surface soil that are treatable would have the vegetation cleared to access the soil and then the treatable surface soil would be removed for treatment purposes. Successful implementation of a remediation technology for the treatable soil, in conjunction with excavation and offsite disposal for non-treatable soil, would reduce the estimated number of trucks required for transport and the estimated volume of backfill soil needed to restore excavated areas. Figure 2.2-3 shows the estimated extents of the PRAs. Table 2.2-7 summarizes the estimated soil volume, number of transport trucks, and backfill required, assuming that the treatable soil was remediated (implementing a technology other than excavation and offsite disposal) to soil Look-Up Table values.

TABLE 2.2-7
**Estimated Soil Volumes and Truck Requirements under the Proposed Action Excavation and Offsite Disposal and Remediation of Treatable Soils Cleanup Technologies**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Removal Parameters | Amounts | Round Trips Required |
|---|---|---|
| Removal Volume [a] | 320,000 $yd^3$ | Not applicable |
| Trucks Required for Soil Removal | 16,842 | 33,684 |
| Truck Frequency for Soil Removal Hauling [b] | 34 trucks per day | 68 per day |
| Backfill Volume—1/3 of total volume (backfill from offsite source or soil treated onsite) | 106,667 $yd^3$ | Not applicable |
| Trucks Required for Backfill Hauling | 5,614 | 11,228 |
| Truck Frequency for Backfill Hauling [b] | 11 trucks per day | 22 trucks per day |
| Hauling Duration | 23 months | Not applicable |
| Daily Material Handled [b] | 1,081 tons per day | Not applicable |

Notes:
[a] Assumes soil is considered non-treatable and the Proposed Action of excavation and offsite disposal is required; however, an alternate remedial technology could be implemented on the remaining soil that has treatable parameters.
[b] Assumes completion of cleanup and soil hauling by the end of 2017.

### Ex Situ Treatment Using Soil Washing

Soil washing could be implemented to remediate soil contaminated with organic and inorganic COCs. Most of the contaminants in soil typically are concentrated in the finer-grained soil (silt and clay), with progressively lower contaminant levels in the coarse-grained soil (sand and gravel). A physical separation of the fine- and coarse-grained particles could be performed to minimize the amount of contaminated material. The separation is made by adding water, and potentially surfactants (detergent), to the soil to make a slurry, which detaches the particles from each other. The washing process also can remove soluble contaminants, which could then be treated more

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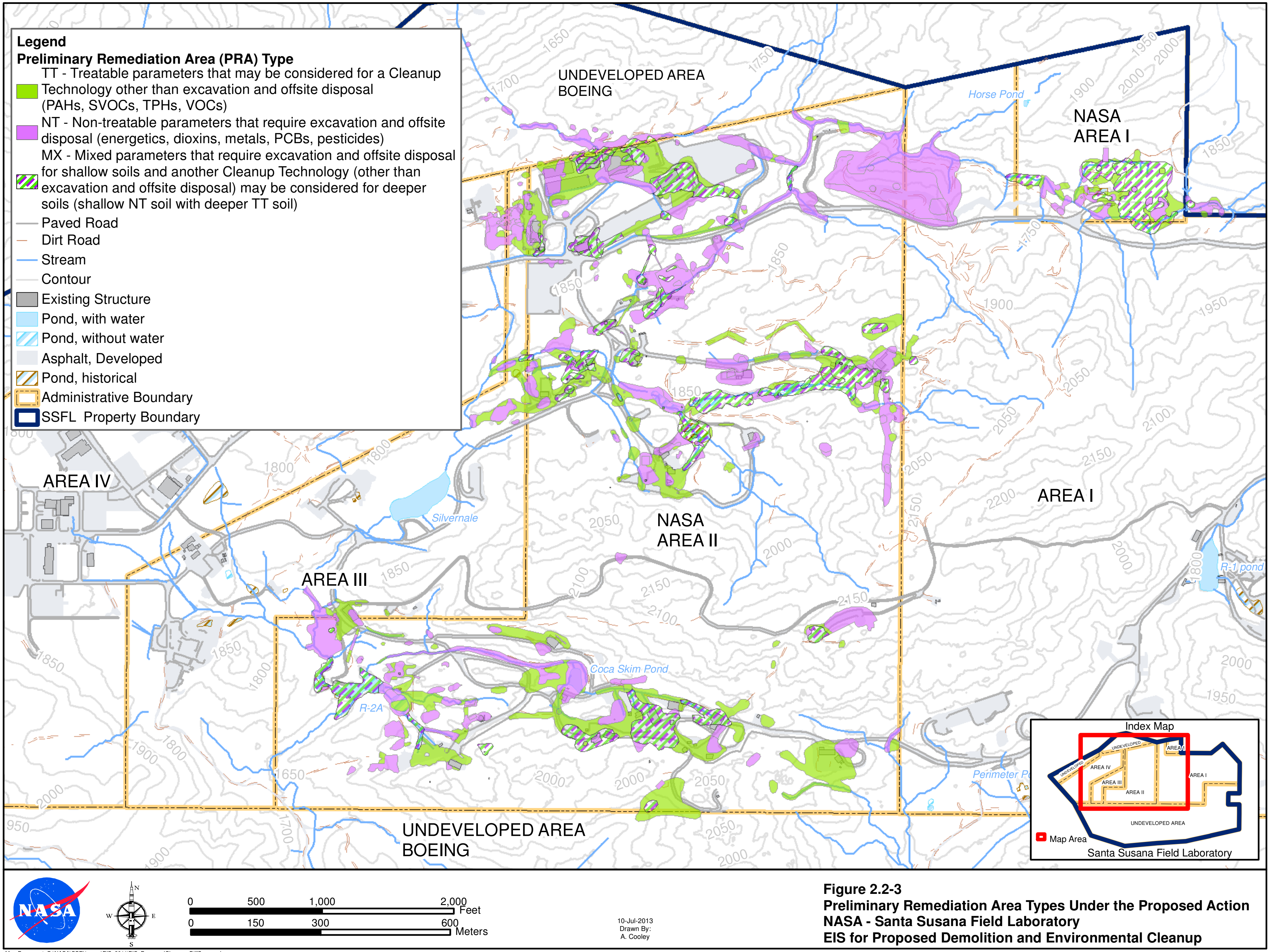


**Figure 2.2-3**
**Preliminary Remediation Area Types Under the Proposed Action**
**NASA - Santa Susana Field Laboratory**
**EIS for Proposed Demolition and Environmental Cleanup**

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readily in the liquid. If the soil contaminants are soluble, the waste stream generated from the washing would have to be treated to meet water quality standards for discharge. The numbers and types of components used in a soil washing treatment plant depend on the types of soil being treated, the natures and concentrations of the contaminants, and the target levels of residual contaminant concentrations.

A location would be selected at each site and a series of sieves would be set up to separate the fine- and coarse-grained soils. A tank with water, and possibly surfactant addition (detergent), would be available to wash the soil through the sieves. The water could be treated by filtration and reused to reduce the amount required for this technology. The solids captured by the filtration system could be disposed of along with the fine-grained soil.

The time required to meet remediation goals using soil washing varies greatly. Therefore, a bench-scale test would be required before implementation. The bench-scale test would provide information regarding the quantity of fine-grained soil that contains contamination and if the coarse-grained soil meets the Look-Up Table values for the residual contamination that could be present. The bench-scale test also would provide information regarding the types of contaminants that could be present within each of the fine- and coarse-grained soils. Monitoring of the soil and the waste stream would continue for the duration of the treatment period until the Look-Up Table values were met. The cleaned coarse soil could be repurposed and used as backfill material, while the fine-grained fraction with contaminated soil subsequently would be disposed offsite. Implementing this technology could take 1.5 to 2.5 years to process the soil at SSFL; however, this timeframe does not include backfilling the excavations with clean soil or disposing of the fine-grained soil containing contaminants or the wastewater stream.

**Soil Vapor Extraction**

Soil vapor extraction (SVE) is used to remediate VOCs that typically are found in cleaning solvents and light petroleum fuels such as gasoline. If SVE is selected, NASA would install a series of vapor recovery wells using mechanical drilling techniques and apply a vacuum to the wells using a blower, associated piping, and manifolds. The vapors in the pore spaces of the soil would then be removed into the air. If required, the air stream from the vapor wells would be transported via pipelines to be treated with granular activated carbon (GAC) or another treatment system such as a flare to absorb the organic vapors before being released to the atmosphere. The wells most likely would be spaced at 10- to 20-ft intervals (spacing would be evaluated during the design phase of the project and would be subject to change) and interconnected with pipes throughout the area selected for treatment. If the area selected for treatment is vegetated, pathways would be cleared for the well and pipeline installations. The system would be operated for a few years and then be removed from the site.

To increase the pore space in the soil (including weathered bedrock) and to increase the radius of influence, the soil matrix could be fractured pneumatically before installation of the SVE wells. Pneumatically fracturing the soil matrix widens the pore space, creates fractures, and enlarges existing factures to increase the effective porosity of the matrix, which results in an increased air flow and allows more vapors to be recovered. NASA would have to monitor the contamination removed in the air stream as part of the operation and maintenance (O&M) efforts. In addition, a power source would be required to operate the system. The Ventura County Air Pollution Control District would specify the monitoring and reporting requirements. Using this technology to remediate the VOCs (identified as treatable soil PRAs in Figure 2.2-3) and assuming implementation of multiple systems with each system fully optimized, it could take 2 to 5 years to meet the Look-Up Table values.

**Ex Situ Treatment Using Land Farming**

This method of onsite treatment could be used to degrade only organic contamination biologically, such as the constituents found in petroleum products (SVOCs and VOCs) located in the treatable volumes of soil that are typically deeper than 2 ft from the surface. Land farming would entail excavating and hauling soil to a designated onsite area using ordinary construction equipment such as front-end loaders, backhoes, and dump trucks. No bedrock or rock outcrops would be removed. The treatment areas typically would be flat and have asphalt or concrete as a base, which could be lined with polyethylene plastic sheeting. The available flat areas at SSFL that could be utilized for implementing this technology may be a limiting factor for the volume of the soil that could be treated at any given time. The size of the land farm would depend on the quantity of soil requiring treatment; the typical thickness of soil would be expected to be between 12 and 18 inches. Soil containing SVOCs and VOCs

(Figure 2.2-3 shows PRAs with treatable soil) could then be placed in the treatment area and nutrients and moisture added to stimulate biodegradation of the organic constituents, using water trucks and tractors with disc attachments to blend in the additives. Once the levels of contamination met criteria, the soil could be hauled back to the site and placed in the excavation area as backfill. Soil monitoring would be required to assess the rate and amount of contamination reduction using this technology.

This technology could require 2 to 4 years to meet the Look-Up Table values. Monitoring would continue for the duration of the ex situ treatment period until Look-Up Table values were met. The frequency of monitoring would be established based on the rate of contamination reduction in the soils (in other words, more frequent at the beginning and less frequent as soils were cleaned). Once the Look-Up Table values were met, soils would be returned to the excavation area and monitoring would be complete. However, if the Look-Up Table values were not met, chemical oxidants (for example, hydrogen peroxide, permanganate, or persulfate) could be mixed into the soil in batches using mixers (described in a following subsection) and containment tanks to further reduce concentrations of the remaining VOCs and SVOCs.

**Ex Situ Treatment Using Oxidation**

This method of onsite treatment could be used to destroy only organic contamination chemically, such as the constituents found in petroleum products (SVOCs and VOCs) in the treatable volumes of soil that are typically deeper than 2 ft from the surface. Ex situ oxidation would entail excavating and hauling soil to a designated onsite area using ordinary construction equipment such as front-end loaders, backhoes, and dump trucks. No bedrock or rock outcrops would be removed. The treatment areas typically would be flat and have asphalt or concrete as a base, which could be lined with polyethylene plastic sheeting. Soil containing SVOCs and VOCs (Figure 2.2-3 shows PRAs with treatable soil) could then be placed in the treatment area and oxidants (for example, hydrogen peroxide, permanganate, and persulfate) added to destroy the organic constituents, using mixers to blend in the additives.

This technology could require 1 to 2 years to meet the Look-Up Table values. Soil monitoring would be required to assess the rate and amount of contamination reduction using this technology. The frequency of monitoring would be established based on the rate of contamination reduction in the soils (in other words, more frequent at the beginning and less frequent as soils were cleaned). Monitoring would continue for the duration of the ex situ treatment period until Look-Up Table values were met. Once the Look-Up Table values were met, soils would be returned to the excavation area and monitoring would be complete.

**Ex Situ Treatment Using Thermal Desorption**

This method could be used to treat only soils contaminated with organic constituents, primarily petroleum products (VOCs and SVOCs) typically more than 2 ft below surface. Soils would be excavated and treated using an onsite heat source (Figure 2.2-3 shows PRAs with treatable soil). Typical equipment would include a rotary dryer, natural gas tanks, soil excavation and transportation trucks, blower, heat exchanger, and gas treatment system (usually a GAC). NASA would heat the soils in the rotary dryer (or similar technology) to target temperatures of about 200 to 600 degrees Fahrenheit (°F) using natural gas or other heating media to volatilize organic contaminants. A carrier gas or vacuum system would transport the volatilized organics to a gas treatment system. NASA would establish an area at the site for thermally treating soil. The area would have to be flat and excavated soil would be stockpiled in one area and moved to the dryer for treatment. Typical treatment volumes would be between 15 and 20 tons per hour for sandy soil. A second stockpile of the treated soil would be maintained and allowed to cool. The size of the treatment area would depend on the quantity of soil requiring treatment. Monitoring of the treated soil would continue for the duration of the ex situ treatment period until the Look-Up Table values have been met. The frequency of monitoring would be established based on the rate of contamination reduction in the soils. Once the Look-Up Table values had been met, monitoring would be discontinued and soils would be left in a stockpile to cool. The soils could then be returned to the excavation area, probably within about a month. The treated soil would be placed in the excavation areas and used as backfill. The entire cycle of this technology could take 1 to 2 years to meet the Look-Up Table values. However, additional time would be required to backfill the excavations with the clean soil.

**In Situ Chemical Oxidation**

This technology could be used to treat only organic contamination such as VOCs and SVOCs in the treatable volume of soil at depths that are deeper than 5 to 10 ft below ground surface (bgs). A network of injection wells or boreholes would be drilled using mechanical drilling techniques and fluids such as oxidants (for example, hydrogen peroxide, permanganate, persulfate, or ozone) would be distributed into the subsurface to treat the contamination. The soil could be pneumatically fractured, as described previously for SVE, to enhance the process before the fluid injection. In addition, nitrogen could be used as a carrier gas to distribute oxidants into the subsurface more effectively. Typical equipment for this process would include drilling rigs, tanks to hold the fluids, pumps, hoses, valves, and a nitrogen source. The wells or boreholes most likely would be spaced at 10- to 20-ft intervals (spacing would be evaluated during the design phase of the project and could be subject to change). If the area selected for treatment is vegetated, pathways would be cleared for the well or borehole installations.

Soil monitoring would be required to assess the rate and amount of contaminant reduction. Monitoring would occur throughout the treatment process until the Look-Up Table Values had been met or a decision was made to implement an alternative remedial approach. The frequency of monitoring would be established based on the rate of contamination reduction in the soils. Once the goals had been met, monitoring would be discontinued. Implementation of this technology to remediate VOCs and SVOCs (Figure 2.2-3 shows PRAs with treatable soil) could require 2.5 to 4 years to reduce the contamination levels enough to meet the Look-Up Table values, and multiple injections within the same wells might be required.

**In Situ Anaerobic or Aerobic Biological Treatment**

This method would treat organic contamination (VOCs and SVOCs) in the treatable soil volume (typically greater than 2 ft bgs) using microorganisms (Figure 2.2-3 shows PRAs with treatable soil). NASA would drill a network of injection wells or boreholes using mechanical methods and would inject fluids into the subsurface to stimulate microbial growth. Fluids could be injected into boreholes as described for in situ oxidation. The fluids could be augmented with oxygen-releasing compounds and nutrients to increase the microorganism populations and to accelerate the treatment process. The wells most likely would be spaced at 10- to 20-ft intervals (spacing would be evaluated during the design phase of the project and could be subject to change). If the area selected for treatment is vegetated, pathways would be cleared for the well or borehole installations.

For aerobic bioremediation, fluids containing inducer and electron acceptors (oxygen) or oxygen to enhance aerobic biodegradation would be injected into the subsurface. In the presence of sufficient oxygen and other nutrients, such as nitrogen and phosphorus, microorganisms would convert many organic contaminants to carbon dioxide and water. For anaerobic bioremediation, electron donors would be injected into the subsurface to stimulate the reduction of chlorinated organic compounds. In the absence of oxygen, the organic contaminants ultimately would metabolize to methane, carbon dioxide, and hydrogen gas. Common electron donors are sugars such as lactate and corn syrup and vegetable oils. Typical equipment used would include a drilling rig, tanks to hold the fluids, and pumps.

Soil monitoring would occur throughout the treatment process until the Look-Up Table values had been met or a decision was made to implement an alternative remedial approach. The frequency of monitoring would be established based on the rate of contamination reduction in the soils. Once the Look-Up Table values had been met, monitoring would be discontinued. Implementation of this technology to remediate the VOCs and SVOCs could require 3.5 to 5.5 years to reduce the contamination levels enough to meet the Look-Up Table values, and multiple injections might be required. However, if the Look-Up Table values had not been met, chemical oxidants (for example, hydrogen peroxide, permanganate, persulfate, or ozone) could be injected into the soil to further reduce the concentrations of the remaining VOCs and SVOCs, as previously described.

**Summary of Potential Soil Treatment Technologies**

Table 2.2-8 provides a summary of the soil cleanup technologies that have potential applicability at SSFL.

TABLE 2.2-8
**Comparison of Soil Remediation Technologies**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Technology | Constituent Treatment | Excavation | Site Restoration | Onsite Trucks | Stockpiling | Offsite Trucks | Permits Required? | Construction | Energy Needs | Soil Monitoring | Duration |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Excavation and offsite disposal | All | Yes | Yes | Yes | Yes | Yes | CWA Permit[a] | Staging Area | No | No | 23 months [b] |
| Soil washing [c] | Organic, Inorganic | Yes | Replacement of soils | Yes | Yes | Yes | CWA Permit[a] | Staging Area/ Treatment Area | No | Yes | 1.5 to 2.5 years |
| Soil vapor extraction [d] | VOCs | No | No | Yes | No | No | VOC Emission Permit | SVE Wells | Yes | Yes | 2 to 5 years |
| Ex situ treatment using land farming [e] | VOCs, SVOCs | Yes | Replacement of soils | Yes | Yes | No | CWA Permit[a] | Staging/ Treatment Area | No | Yes | 2 to 4 years |
| Ex situ treatment using oxidation [d] | VOCs, SVOCs | Yes | Replacement of soils | Yes | No | No | CWA Permit[a] | Temporary Mixing Structure | Yes | Yes | 1 to 2 years |
| Ex situ treatment using thermal desorption [f] | VOCs, SVOCs | Yes | Replacement of soils | Yes | No | No | CWA Permit[a] VOC/SVOC Emission Permit | Temporary Thermal Desorption Chamber | Yes | Yes | 1 to 2 years |
| In situ chemical oxidation [g] | VOCs, SVOCs | No | Grading of disturbed soils | Yes | No | No | Injection Permit | Injection Wells or Boreholes | No | Yes | 2.5 to 4 years |
| In situ anaerobic or aerobic biological treatment [h] | VOCs, SVOCs | No | Grading of disturbed soils | Yes | No | No | Injection Permit | Injection Wells or Boreholes | No | Yes | 3.5 to 5.5 years |

Notes:
*Note that information is common to all action alternatives.*
*Footnote assumptions:*

[a] Subject to Clean Water Act (CWA) Section 404 and Section 401 permitting if soil treatment requires the disturbance of a jurisdictional water body (wetlands, drainages, and ponds)
[b] Completion of cleanup and soil hauling by the end of 2017.
[c] 4 months to mobilize equipment, 5 months and 53 trucks per day to move soil to treatment area, no major weather complications.
[d] 3 months to install wells and equipment, multiple SVE systems would be deployed simultaneously, systems are optimized against surface leaks, and sites have similar subsurface conditions (air permeability, depth to water).
[e] 4 months to set up treatment area, 5 months and 34 trucks per day to move soil to treatment area, a large area is readily available without requiring extensive grading, <20% failed soil treatment, no major weather complications.
[f] 4 months to install equipment, 5 months and 34 trucks per day to move soil to treatment area, nominal thermal system operation, power is readily available, no major weather complications.
[g] Bench testing to optimize dosages, 9 months to install injection and monitoring wells, a relatively aggressive flux and re-application planned.
[h] Microcosm bench testing required, 9 months to install injection and monitoring wells, reinjection applications would be required to promote full dispersion throughout target zone.

### 2.2.3 Proposed Groundwater Remedial Activities

This subsection describes the proposed cleanup of groundwater and summarizes the potential remedial technologies that might be used to reach risk-based cleanup levels, as described in the Standardized Risk Assessment Methodology (SRAM) (MWH, 2005). For the purpose of this EIS, groundwater is defined specifically by the 2007 Consent Order as the water level within the alluvium or weathered bedrock layers and the Chatsworth formation aquifer, and both saturated and unsaturated unweathered (competent) bedrock. As defined in the 2010 AOC, groundwater also can include soils contaminated by soil vapor (VOCs) from groundwater.

The areas of impacted groundwater (AIGs) associated with the NASA SSFL sites have been identified as five separate areas. Figure 2.2-4 shows each AIG, along with its associated VOC impacts to the soil and soil vapor. Each AIG is summarized as follows:

- AIG 5 (LOX Plant Area)
  - Contaminants of potential concern (COPCs) include trichloroethene (TCE) and its degradation products and 1,4-dioxane (MWH, 2008b; 2009a).
  - Depth to groundwater within AIG 5 ranges from approximately 30 to 425 ft bgs).
- AIG 6 (ELV Area) and AIG 7 (Building 204 Area)
  - AIG 6 COPCs include TCE and its degradation products.
  - Depth to groundwater within AIG 6 ranges from approximately 12 to 240 ft bgs.
  - AIG 6 TCE plume is combined with the AIG 7 TCE plume.
  - AIG 7 COPCs include TCE and its associated degradation products and 1,2,3-trichloropropane.
  - Depth to groundwater within AIG 7 ranges from approximately 77 to 317 ft bgs
- AIG 8 (Alfa and Bravo Test Stand Areas, Alfa/Bravo Fuel Farm, and SPA)
  - COPCs include TCE and its degradation products, 1,4-dioxane, and n-nitrosodimethylamine (NDMA)
  - Depth to groundwater within AIG 8 ranges from approximately 16 to 267 ft bgs.
- AIG 9 (Coca and Delta Test Stand Areas, R-2 Ponds, and Coca/Delta Fuel Farm)
  - COPCs include TCE and its degradation products, 1,4-dioxane, and NDMA.
  - Depth to groundwater within AIG 9 ranges from approximately 7 to 267 ft bgs.

#### 2.2.3.1 Groundwater Cleanup

Under the Proposed Action, groundwater would be cleaned up consistent with the risk-based protocol level using the guidelines in the SRAM, as described in the 2007 Consent Order.

Risk-based protocols are used to help NASA and other decision makers assess the possible ways in which people and animals (receptors) could be exposed to groundwater contaminants. For a risk to be present, the receptors at SSFL potentially must be exposed to the contaminated groundwater. After potential groundwater exposure to receptors has been confirmed, the extent of exposure can be evaluated using different criteria, including the duration of exposure, the type of contamination to which a sensitive receptor would be exposed, the frequency of exposure, and the relative toxicity of the contaminant.

NASA has conducted numerous studies and surveys to characterize the existing groundwater contamination at SSFL as part of the RFI process. One of the studies, known as a corrective measures study, evaluated potential technologies that could be effective in meeting these risk-based levels.

#### 2.2.3.2 Groundwater Cleanup Technologies

The fractured sandstone underlying SSFL is a complex subsurface media, and it is challenging to investigate and implement remediation technologies. Potential remediation technologies are being evaluated for their effectiveness to attempt to clean up the specific contaminants at the site. The effectiveness of the remediation technologies would be evaluated by implementing treatability studies at the site. Site conditions, including weather, soil conditions, and terrain, were considered in evaluating the viability of the technologies. These technologies are identified in the RIs (NASA, 2009a; 2009b; 2008b) and in the *Groundwater Interim Measures Work Plan* (MWH, 2007a).

In addition, *Treatability Study Work Plan Addendum #1*, *In Situ Chemical Oxidation Field Experiment* (MWH, 2012b) and the *Feasibility Study Work Plan* (MWH, 2009a) provide additional information regarding the selection of the groundwater remedial technologies. Each technology is described in this subsection, including the contaminant classification each addresses, the approach and application of the technology implementation, and the timeline of each. One or a combination of these technologies might be applied to attempt to meet the groundwater cleanup levels. Figure 2.2-4 shows the estimated extent of the TCE groundwater plume as screened against the U.S. Environmental Protection Agency (EPA) maximum contaminant level (MCL). Final groundwater cleanup levels would be developed on the basis of the risk assessment protocols described in the SRAM (MWH, 2005).

**Pump and Treat**

This technology, referred to as a GETS, currently is being used at SSFL to recover contaminated groundwater. GETSs are used to extract contaminated groundwater and treat the contaminants (VOCs and SVOCs) using an ex situ treatment technology such as an ion exchange column (for metals), GAC, or oxidation. A GAC system contains carbon that has been manufactured such that the grains have a large surface area with many “active sites” that can adsorb organic constituents. However, GETSs primarily are used to create hydraulic capture zones to prevent contaminated groundwater from migrating to areas outside of the hydraulic capture zones. Groundwater extraction occasionally can reduce groundwater flow to nearby wetlands, seeps, and springs that are a source of water to plants and wildlife.

Currently, the NASA GETS system consists of one well; however, NASA plans to add additional wells. A power source would be required to operate the system. NASA could use alternative sources of energy such as solar arrays to provide some of the power requirement. Some pump-and-treat infrastructure is in place as part of the existing GETS system. Additional wells at depths ranging from approximately 50 to 900 ft bgs and 13,000 ft of aboveground pipeline would be added to the existing system for this remedial technology to cover the full area shown in Figure 2.2-4. If the wells and pipelines would be located in vegetated areas, narrow pathways may need to be cleared and grubbed for drilling equipment access and pipeline installation. This technology likely would take decades to centuries before the groundwater would meet the cleanup standards. Monitoring would occur during, and for a period after, the treatment process.

**Vacuum Extraction**

This approach could be used to recover VOCs and includes installing a network of extraction wells using mechanical drilling methods in the target treatment zone. Depths of new extraction wells could range from approximately 50 to 900 ft bgs. Vapors would be extracted from a given extraction well (via SVE) in the saturated soil or bedrock matrix using blowers, pipelines, and manifolds. The treatment zone might be dewatered (as previously described for pump and treat) to apply a vacuum to the vapors. If minor amounts of groundwater are present, it could be extracted and would be treated onsite locally or by the GETS and injected into the subsurface or released to surface drainage. The vapors that would be recovered could be treated by a GAC system (or other treatment system), which would require piping and manifolds, before being released to the atmosphere.

The wells would be spaced on 10- to 20-ft intervals (a treatability study would be conducted and spacing would be evaluated and could be subject to change) and interconnected with piping, most likely along the surface, to the blower and the treatment system. The system most likely would operate for a few years and then be removed from the site. If the area selected for treatment is vegetated, pathways would be cleared for the well and pipeline installations. The contamination removed in the air and groundwater streams would require monitoring as part of the O&M efforts. In addition, a power source would be required to operate the system. NASA could use alternative sources of energy such as solar arrays to provide some of the power requirement. This technology could require years to meet the cleanup standards. Monitoring would occur throughout the treatment process.

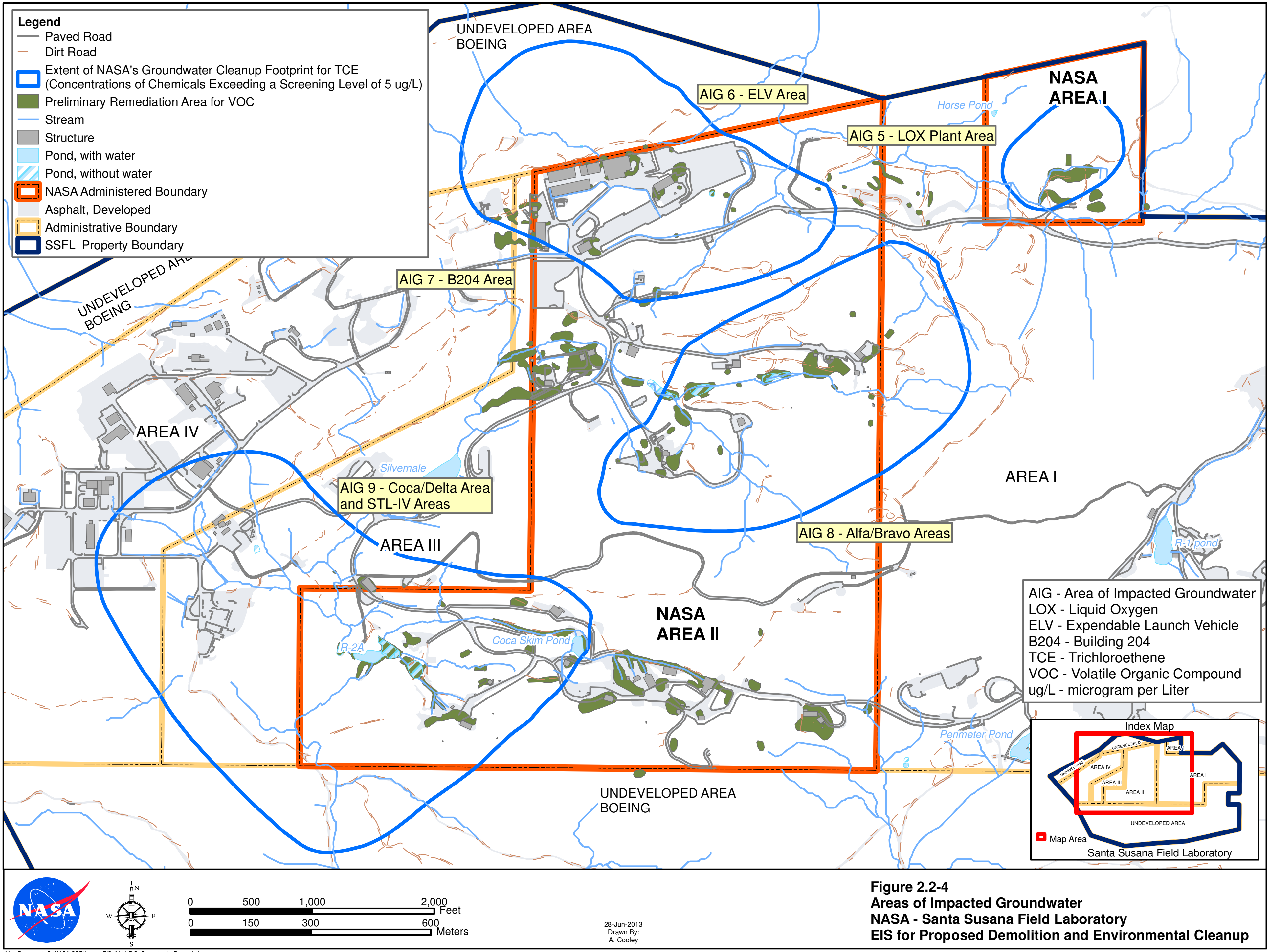


**Figure 2.2-4**
**Areas of Impacted Groundwater**
**NASA - Santa Susana Field Laboratory**
**EIS for Proposed Demolition and Environmental Cleanup**

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**Heat-driven Extraction**

This treatment, used to recover VOCs and SVOCs, entails heating the subsurface to near or at the boiling point of water using a series of wells or boreholes installed by mechanical drilling methods. Depths of new wells installed could range from approximately 50 to 900 ft bgs. The groundwater and surrounding matrix would be heated using steam, electrical resistance heating, heating elements, or other source of heat. The entire matrix would be heated and the groundwater, along with the VOCs in the surrounding matrix, could be recovered using an SVE system, as described previously under "Vacuum Extraction" earlier in this section. The recovered vapors would be cooled and treated onsite as a liquid, vapor, or both, before being released to the atmosphere (vapors only). Typical equipment would include piping, manifolds, heat source (steam, electric resistance heating, or heating elements), SVE system, heat exchangers, GAC system (or other vapor treatment system), and tanks. The spacing of the heating and SVE wells would depend on the results of a treatability study. If the wells and pipelines would be located in vegetated areas, narrow pathways may need to be cleared and grubbed for drilling equipment access and pipeline installation.

Monitoring would occur throughout the treatment process until the cleanup levels had been met or a decision was made to implement an alternative remedial approach. The frequency of monitoring would be established based on the rate of contamination reduction in the groundwater. Once the cleanup levels had been met, monitoring would be discontinued. This technology could take years to reduce the contamination levels enough to meet the cleanup levels.

**In Situ Chemical Oxidation**

Chemical oxidation is used to chemically destroy VOCs and SVOCs in situ. This treatment method requires that a series of injection wells or boreholes be installed (could be spaced on 10- to 20-ft intervals, but the spacing would be subject to change during the design phase of the project) using mechanical drilling methods in the target treatment area. Depths of new wells installed could range from approximately 50 to 900 ft bgs. Oxidants would be delivered to the subsurface either by gravity feed or pumping via the injection wells. The oxidants react with and destroy the VOCs in the groundwater and surrounding matrix and create carbon dioxide and water as byproducts. This process possibly could be enhanced by pneumatically fracturing the subsurface before the oxidants are introduced into the subsurface, as previously described.

If the oxidants (for example, hydrogen peroxide, permanganate, persulfate, or ozone) need to be continuously added to the groundwater for treatment, the wells would be interconnected by a series of pipelines connected to a feed tank. The appropriate amount of oxidant would be metered to the wells. If the area within the treatment zone is vegetated, pathways for well and borehole installation and pipeline configuration would be cleared. Typical equipment for this process would include drilling rigs, tanks to hold the fluids, pumps, hoses, and valves. The groundwater would require monitoring to assess the rate and amount of contaminant reduction. Monitoring would occur throughout the treatment process. This technology could take months to years to reduce the contamination to concentrations that would meet the cleanup levels, and multiple injections over time might be required.

**In Situ Enhanced Bioremediation**

This technology is used to treat organic contamination (VOCs and SVOCs) in groundwater using microorganisms. NASA would install a network of injection wells (and borings) and inject fluids into the subsurface to stimulate microbial growth. Depths of new wells installed could range from approximately 50 to 900 ft bgs and could be spaced on 10- to 20-ft intervals (subject to change in the design phase of the project on the basis of treatability study results). The fluids could be augmented with microorganisms to increase their populations and accelerate the treatment process. For aerobic bioremediation, fluids containing electron acceptors (oxygen) to enhance aerobic biodegradation would be injected into the subsurface. In the presence of sufficient oxygen and other nutrients, such as nitrogen and phosphorus, microorganisms would convert many organic contaminants to carbon dioxide and water. For anaerobic bioremediation, NASA would inject electron donors into the subsurface to stimulate the reduction of chlorinated organic compounds. In the absence of oxygen, the organic contaminants ultimately would metabolize to methane, carbon dioxide, and hydrogen gas.

If fluids needed to be continuously added to the groundwater for treatment, the wells would be interconnected by a series of pipelines connected to a feed tank. The appropriate amount of fluid would be metered to the wells. If the area within the treatment zone is vegetated, pathways for well and borehole installation and pipeline configuration would be cleared. Typical equipment for this process would include drilling rigs, tanks to hold the fluids, pumps, hoses, and valves. Groundwater monitoring would be required to assess the rate and amount of contaminant reduction, with monitoring continuing throughout the treatment process. This technology could take months to years to reduce the contamination to concentrations that would meet the cleanup levels, and multiple injections over time might be required.

### Monitored Natural Attenuation

NASA could use monitored natural attenuation (MNA) to evaluate the reduction in contamination over a period of time once a treatment technology had been implemented or the naturally occurring attenuation processes had proven effective in reducing contamination in the subsurface. The data collected during the MNA study could be used to evaluate whether contamination concentrations would reach the groundwater cleanup levels within an established timeframe or if other remedial technologies would need to be implemented. MNA could be implemented as an independent remedial approach or in coordination with another remedial technology. As an independent technology, MNA could take decades to centuries to meet the cleanup levels. Monitoring would continue until the cleanup levels were met or a decision was made to implement an alternative remedial approach.

### Institutional Controls

NASA would use institutional controls to restrict access to contaminated water bodies by including specific restrictive provisions in dig permits, utility clearances, or other development permits in designated areas where contaminated groundwater is known to exist. With these restrictions, NASA could limit or eliminate potential groundwater exposure pathways.

### Summary of Potential Groundwater Cleanup Technologies

Table 2.2-9 provides a general comparison of the groundwater cleanup technologies.

TABLE 2.2-9
**Comparison of Groundwater Remediation Technologies**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Technology | Constituent Treatment | Construction | Chemical Usage | Depth | Monitoring | Energy Needs | Permits Required? | Duration |
|---|---|---|---|---|---|---|---|---|
| Pump and Treat | VOCs and SVOCs | Additional wells, aboveground pipeline; expand GETS system | Yes | 50-900 ft bgs | Yes | Yes | Potentially NPDES and/or Air Permit | Decades to Centuries |
| Vacuum Extraction | VOCs | Extraction wells | No | 50-900 ft bgs | Yes | Yes | Air Permit | Years |
| Heat-driven Extraction | VOCs and SVOCs | Extraction wells | No | 50-900 ft bgs | Yes | Yes | Air Permit | Years |
| In situ Chemical Oxidation | VOCs and SVOCs | Injection wells or boreholes | Oxidants | 50-900 ft bgs | Yes | No | Injection Permit | Months to Years |
| In situ Enhanced Bioremediation | VOCs and SVOCs | Injection wells or boreholes | Aerobic microbial fluids | 50-900 ft bgs | Yes | No | Injection Permit | Months to Years |

TABLE 2.2-9
**Comparison of Groundwater Remediation Technologies**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Technology | Constituent Treatment | Construction | Chemical Usage | Depth | Monitoring | Energy Needs | Permits Required? | Duration |
|---|---|---|---|---|---|---|---|---|
| Monitored Natural Attenuation and Institutional Controls | VOCs and SVOCs | Monitoring wells/ potentially fencing and signage | No | N/A | Yes | No | No | Decades to Centuries |

Notes:
N/A = not applicable
NPDES = National Pollutant Discharge Elimination System
*Information is common to all action alternatives.*

## 2.3 No Action Alternative

The Council on Environmental Quality (CEQ) regulations (40 *Code of Federal Regulations* [CFR] 1502.14(d)) requires that an EIS include consideration of a No Action Alternative. For the purpose of this analysis, the No Action Alternative considers a continuation of current activities, with no other action, as described and evaluated in this EIS.

Under this alternative, NASA would not demolish test stands or ancillary structures on the NASA-administered property at SSFL. Furthermore, NASA would not conduct soil remediation at the site or groundwater treatment beyond the groundwater interim measure and interim source removal action activities currently being conducted under separate regulatory direction. Ongoing groundwater and surface water sampling being conducted on the site would continue. Once these ongoing remedial programs are concluded, no further remedial action would occur. Contaminants not captured by these programs would remain in place or attenuate naturally over time. No monitoring would occur as part of this natural attenuation.

The No Action Alternative would not meet NASA's obligations under the 2010 AOC and the 2007 Consent Order or the Purpose and Need, as previously described. The No Action Alternative is used as a baseline against which to assess the environmental impacts of the Proposed Action and other action alternatives.

## 2.4 Alternatives Eliminated from Further Consideration

NASA considered a broad range of alternatives for both the demolition and environmental cleanup components of the Proposed Action, as well as for the remedial technologies considered under each environmental cleanup alternative. Those that were eliminated as viable alternatives are discussed in the following subsections; they are not considered further in this EIS.

### 2.4.1 Action Alternatives Eliminated from Further Consideration

In addition to the Proposed Action (Section 2.2), NASA considered alternatives other than a cleanup to background as stipulated in the 2010 AOC. The action alternatives considered and evaluated would implement the soil and groundwater remediation technologies previously discussed to achieve various risk-based cleanup levels, specifically the Suburban Residential, Commercial/Industrial, and Recreational risk-based cleanup levels.

In general, risk-based protocols are designated for each of these cleanup levels to help assess the possible ways in which people and animals (receptors) could be exposed to soil and groundwater contaminants and the health risks associated with that exposure. A receptor must have the potential for exposure to the contaminated soil for a risk to be present. After the potential for exposure to receptors has been confirmed, the extent of exposure can be evaluated using different criteria, including the duration of exposure, the type of contamination to which a sensitive receptor would be exposed, the frequency of exposure, and the relative toxicity of the contaminant. In other words, based on the number of days a receptor is on SSFL, the areas the receptor might access, and the conditions of the site, a risk-based protocol would be established that would designate what cleanup level would be necessary to keep that receptor healthy and safe. Additional information regarding risk assessments is provided in the draft RFI and RI Reports for Groups 2, 3, 4, and 9, located on the DTSC website (http://www.dtsc-ssfl.com/default.asp?V_DOC_ID=941).

These risk-based alternatives were eliminated from further consideration because they would not meet the requirements of the 2010 AOC. In addition, a CEQ letter dated June 19, 2012 (Appendix A), states that NASA is not compelled to consider comprehensive cleanup measures as alternatives that are less than the cleanup to local background levels described in the 2010 AOC. Additional information regarding these alternatives is provided at http://ssfl.msfc.nasa.gov/documents/eis/NASA-SSFL-EIS-Alternatives-Eliminated.pdf.

#### 2.4.1.1 Alternative 1–Demolition, Soil Cleanup to Suburban Residential Cleanup Goals, and Groundwater Cleanup

This alternative would entail the cleanup of soil and groundwater to meet Suburban Residential soil cleanup goals, and Suburban Residential drinking water standards. The exposure scenario for Suburban Residential cleanup assumes that both adults and children would be exposed to soil and groundwater at a home. The exposure duration is assumed to be 24 hours per day, 350 days per year, for a total of 30 years.

The exposure to residents is assumed to include surface soil (0 to 2 ft) and subsurface soil to a depth of 10 ft (assuming that the home has a basement). The exposure route for soil would include accidental ingestion, inhalation of soil particles, and dermal contact. It is assumed that the residents would be exposed to vapors in the soil gas from the subsurface soil via a process known as vapor intrusion.

For the groundwater exposure scenario, the primary expected exposure routes include ingestion as residents drink the water (an estimated 2 liters per day), inhalation of vapors emanating from the water, and absorption via dermal contact through washing. The Alternative 1 cleanup area and volume are estimated to be approximately 18 acres and 182,000 $yd^3$, respectively. Table 2.4-1 lists the potential environmental impacts for Alternative 1.

#### 2.4.1.2 Alternative 2–Demolition, Soil Cleanup to Commercial/Industrial Cleanup Goals, and Groundwater Cleanup

The exposure scenario for Commercial/Industrial soil cleanup assumes that adults would be exposed to soil and vapors while at work. The exposure duration is assumed to be 8 to 10 hours per day, 250 days per year, for a total of 25 years. The media to which the residents would be exposed include surface soil (0 to 2 ft) and subsurface soil to a depth of 10 ft. The exposure route for soil would include accidental ingestion, inhalation of soil particles, and dermal contact. The evaluation uses the assumption that the workers would be exposed to vapors in the soil gas from the subsurface soil and groundwater via the vapor intrusion pathway.

The approximate area and volume of soil that would require excavation under these scenarios to meet the Alternative 2 Look-Up Table values is estimated to be approximately 10 acres and 92,000 $yd^3$, respectively. Table 2.4-1 lists the potential environmental impacts for Alternative 2.

TABLE 2.4-1
**Alternatives Comparison**
*NASA SSFL EIS for the Proposed Demolition and Environmental Cleanup*

| Technology | Proposed Action | Alternative 1 | Alternative 2 | Alternative 3 | No Action Alternative |
|---|---|---|---|---|---|
| Description | Demolition, Soil Cleanup to Background Levels, Groundwater Cleanup | Demolition, Soil Cleanup to Suburban, Groundwater Cleanup | Demolition, Soil Cleanup to Commercial/ Industrial, Groundwater Cleanup | Demolition, Soil Cleanup to Recreational, Groundwater Cleanup | No action taken for demolition, soil, or groundwater remediation other than currently approved activities |
| Meets the 2010 AOC Commitments | Yes | No | No | No | No |
| Cubic Yards of Soil Remediated | 500,000 | 182,000 | 92,000 | 58,000 | 0 |
| Acres of Soil Removed | 105 | 18 | 10 | 6 | 0 |
| Approximate Remediation Costs | $200,000,000 | $79,640,000 | $39,310,000 | $26,690,000 | |
| Total Trucks Required for Soil Removal (assuming soils are hauled offsite) | 26,441 | 9,568 | 4,860 | 3,031 | 0 |
| Frequency (trucks per day) for Soil Removal | 53 | 19 | 10 | 6 | 0 |
| Backfill Volume ($yd^3$) —1/3 of total volume | 167,000 | 61,000 | 31,000 | 19,000 | 0 |
| Total Trucks Required for Backfill Hauling (assuming backfill sourced offsite) [a] | 8,814 | 3,189 | 1,620 | 1,010 | 0 |
| Frequency (trucks per day) for Backfill Hauling [b] | 18 | 6 | 3 | 2 | 0 |

Notes:
[a] Assumes truck capacity of 19 $yd^3$/truck or 24 tons/truck
[b] Assumes completion by the end of 2017

#### 2.4.1.3 Alternative 3–Demolition, Soil Cleanup to Recreational Cleanup Goals, and Groundwater Cleanup

This alternative would entail the cleanup of soil to meet Recreational risk-based criteria and groundwater cleanup. The exposure scenario for Recreational cleanup assumes that both adults and children are exposed to soil and groundwater while performing recreational activities. The exposure duration is assumed to be several hours per day, 50 days per year, for a total of 30 years. The media to which the recreationists would be exposed include surface soil (0 to 2 ft) and subsurface soil to a depth of 10 ft. The exposure routes for soil would include accidental ingestion, inhalation of soil particles, and dermal contact. The analysis assumes that recreationists would be exposed to vapors in the soil gas from the subsurface soil and groundwater via the vapor intrusion pathway.

The approximate area and volume of soil that would require excavation under these scenarios to meet the Alternative 3 Look-Up Table values is estimated to be approximately 6 acres and 58,000 $yd^3$, respectively. Confirmatory sampling would verify that the necessary contaminated soils were removed to meet the Look-Up Table values. The potential environmental impacts for Alternative 3 are listed in Table 2.4-1.

#### 2.4.1.4 Comparison of Alternatives

Table 2.4-1 provides a general comparison of the project components under the Proposed Action, Action Alternatives, and No Action Alternative. On the basis of the soil volumes estimated under the excavation and offsite disposal technology, Table 2.4-2 provides a comparison of excavation volumes by waste type under the Proposed Action and each action alternative that was considered but not carried forward further.

TABLE 2.4-2
**Alternative Comparison of Offsite Waste Type**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Landfill (Waste Type) | %[a] | Proposed Action (Background) | Alternative 1 (Residential) | Alternative 2 (Industrial) | Alternative 3 (Recreational) |
|---|---|---|---|---|---|
| **Nonhazardous Waste**<br>• Buttonwillow Landfill, CA<br>• Antelope Valley Landfill, CA | 10% | 50,200 $yd^3$<br>2,644 Trucks | 18,200 $yd^3$<br>958 Trucks | 9,200 $yd^3$<br>484 Trucks | 5,800 $yd^3$<br>305 Trucks |
| **Hazardous Waste**<br>• U.S. Ecology Landfill, NV<br>• Kettleman Hills, CA<br>• Buttonwillow Landfill, CA | 80% | 401,600 $yd^3$<br>21,153 Trucks | 145,600 $yd^3$<br>7,663 Trucks | 73,600 $yd^3$<br>3,874 Trucks | 46,400 $yd^3$<br>2,442 Trucks |
| **Radiological/Mixed Waste**<br>• Energy Solutions Landfill, Utah | 10% | 50,200 $yd^3$<br>2,644 Trucks | 18,200 $yd^3$<br>958 Trucks | 9,200 $yd^3$<br>484 Trucks | 5,800 $yd^3$<br>305 Trucks |
| **Total Volume and Truck Loads by Alternative** | | **500,000 $yd^3$**<br>**26,441 Trucks** | **182,000 $yd^3$**<br>**9,579 Trucks** | **92,000 $yd^3$**<br>**4,842 Trucks** | **58,000 $yd^3$**<br>**3,053 Trucks** |

Note:
[a] Percentage is based on data from Group 2, 3, 4, and 9 remedial investigation reports

## 2.4.2 Remedial Technologies Eliminated

During the evaluation of possible remedial cleanup technologies, technologies were eliminated for cleaning up soil and groundwater. These technologies are described in the following subsections.

### 2.4.2.1 Soil Technologies Eliminated

**Excavation, Corrective Action Management Unit, and Encapsulation**

This technology would involve excavation, as described previously. However, instead of staging and transporting soils offsite to an approved offsite landfill facility, this remedial technology would involve siting, permitting, constructing, and encapsulating a corrective action management unit (CAMU) on SSFL. A CAMU is a waste management unit specifically intended for storage, treatment, or disposal of waste generated from onsite remediation activities and cannot be used for disposal of offsite waste or waste from onsite industrial processes. DTSC would need to designate the CAMU in a corrective action order issued pursuant to the provisions of the California Hazardous Waste Control Law (California Health and Safety Code [CHSC] Section 25187) or State superfund law (CHSC Section 25358.9). The time period needed to obtain final approval of the CAMU is estimated to be up to 12 to 18 months from initial submittal of the design information required by Title 22, *California Code of Regulations* Section 66264.552, to issuance of the order authorizing the CAMU.

Because this approach does not remove or destroy contamination within the soils at SSFL, it would not meet the obligations set forth in the 2010 AOC.

**Institutional Controls**

Access to contaminated areas of SSFL could be restricted primarily through fencing, with signage and security being present at the site. By erecting fences with visible hanging signage warning trespassers to keep out of the area and restricting access to SSFL through security measures, potential exposure to humans would be limited or eliminated. The fencing and signage would require inspections at a frequency that would allow NASA to make repairs as needed.

Because this approach does not remove or destroy contamination within the soils at SSFL, it would not meet the obligations set forth in the 2010 AOC.

**In Situ Physical Treatment Using Soil Mixing**

This technology would entail using large-diameter augers or Lang-tool mixers to disturb the soil physically with a series of borehole locations. Hot air, steam, hydrogen peroxide, zero valent iron (ZVI), or other fluids would be mixed into the soil to treat the contamination in place. Typical equipment would include large drilling rigs, tanks, piping, and valves. If a heat source were required, equipment would be needed to heat either air or water. This technology primarily is used to treat organic compounds (VOCs and SVOCs). This technology was eliminated because the ex situ methods for treating soil are likely to be more effective in reducing contamination due to the better contact between the treatment fluids and the soil once they have been removed from the subsurface, rather than treating in place in the subsurface.

**Phytoremediation**

This method is primarily for use in wetland areas or where the depth to groundwater is about 3 to 5 ft bgs. Phytoremediation has been known to treat VOCs, some metals, and PCBs. Trees such as cottonwoods or poplars can uptake moisture that contains contaminants and metabolize the contaminants. An irrigation system using treated groundwater and fertilizers might be required to enhance plant growth. However, because of the dry climate and deep groundwater depths at SSFL (greater than 3 to 5 ft bgs and up to 100s of ft bgs), as well as the slow uptake rates of the moisture that contains contamination, the likelihood of success in meeting the risk-based cleanup levels is low for groundwater. Approximately 3 acres of wetlands are within the NASA-administered portion of SSFL (2 acres within remediation areas) and 1.9 of the 3 acres are streams that intermittently flow. Therefore, the streams may not be able to adequately support non-native plant life that would be required for this technology, and the uptake rates of the plants are slow and most likely will not remediate the wetlands by 2017. Additionally, an estimated 25 percent of the plants would not survive and would require replacement.

Therefore, NASA eliminated this technology from further evaluation. However, the data collected from phytoremediation studies conducted by the Department of Energy or The Boeing Company will be evaluated. If the results from the phytoremediation studies show that this remedial technology can meet soil Look-Up Table values within the 2017 timeframe (as required by the 2010 AOC), NASA will reconsider the use of this technology.

**Monitored Natural Attenuation**

MNA for soil typically is applied in coordination with another remedial technology, such as when an alternative remedial technology has been applied to remove VOCs and is no longer effective in further reducing VOC levels. MNA could then be applied to remove residual contamination over time. MNA could require 50 to 85 years (possibly longer) to meet the prescribed cleanup levels. Therefore, NASA eliminated this technology from further evaluation due to the length of time required to achieve Look-Up Table values.

### 2.4.2.2 Groundwater Technologies Eliminated

**Air Sparging**

Air sparging involves inserting a series of wells used to inject air into the subsurface to volatilize VOCs into the gas phase and removing that gas with a conventional SVE system (previously described). This technology was eliminated because near-surface groundwater is not present at all the sites and a large volume of water is needed to effectively strip out VOCs.

**Surfactant Flushing**

Surfactant flushing involves injecting surfactant solutions into saturated media through a series of injection wells or boreholes to reduce the surface tension between the oil and flooded medium. The fluids are then removed downgradient from the injection location and treated or disposed. This technology was eliminated because near-surface groundwater is not present at all the sites and a large volume of water is needed to remove the groundwater that is required for surfactant flushing.

**Iron Particle Injection**

This technology is used to treat chlorinated VOCs and also could be used to lower the oxidation state of metals to make them less soluble in water and render them less mobile. Similar to chemical oxidation, NASA would install a network of injection wells or boreholes using mechanical methods and ZVI slurry (water and iron powder). Depths of new wells installed could range from approximately 50 to 900 ft bgs. The slurry would be mixed in tanks onsite and delivered to the subsurface either by pumping or by combining it with nitrogen as a carrier gas to disperse the ZVI slurry as fine particles in the subsurface. The byproducts of treating chlorinated VOCs include methane, carbon dioxide, and hydrogen gas. This technology was eliminated from further consideration because of the limited proven results in fracture rock with matrix diffusion processes ongoing.

### 2.4.2.3 Overland Conveyor and Rail Transport of Soil

This remedial technology involves the construction and operation of an overland conveyor system that would route soils removed from SSFL to an offsite rail staging area. From that location, the stockpiled soils would be loaded on rail cars for transport to disposal facilities. The conveyor-rail system also could be used to transport clean soil to SSFL as backfill. Upon completion of the soil removal and backfill process, the conveyor system and offsite rail staging area would be removed and installation sites restored, as required.

Potential conveyor routes were identified based on several considerations including topography, location of existing rail system facilities in the facility, access road availability, offsite property ownership, cultural and biological resources, and other environmental factors. Ultimately, two potential routes were identified for construction of an elevated, enclosed conveyor system that would transport excavated soils from the northern side of SSFL toward the Simi Valley area. Four general locations were identified as terminal points for the conveyor for construction of rail staging areas adjacent to the existing railroad network. Figure 2.4-1 shows potential conveyor routes and rail siting locations (Sites 1, 2A, 2B, and 4). Licensed solid waste facilities (intrastate and interstate) that likely could accept the soils for disposal, and located at or close to rail line networks, also were identified.

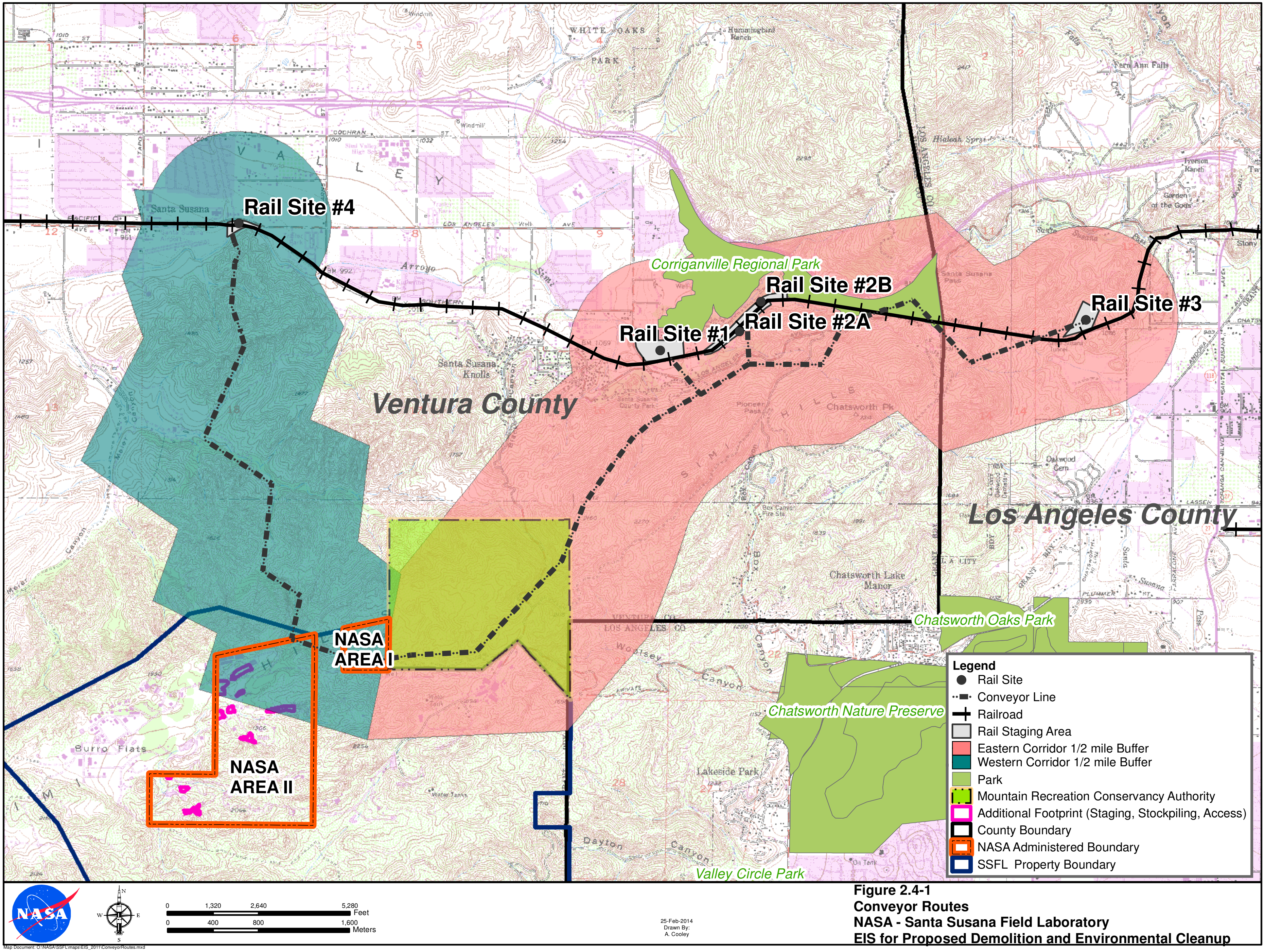


**Figure 2.4-1**
**Conveyor Routes**
**NASA - Santa Susana Field Laboratory**
**EIS for Proposed Demolition and Environmental Cleanup**

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This alternative soil transport and disposal option is considered technically feasible. However, several key factors might affect NASA's ability to actually implement this alternate approach at SSFL:

- Assuming that no implementation restrictions exist, the time required to complete the prerequisite surveys, studies, and engineering/designs to support applications for required permits is a potentially significant constraint in terms of meeting the cleanup requirement date for SSFL.
- The ability to actually obtain the prerequisite permits has a high degree of uncertainty, especially when integrated with the project cleanup schedule requirements.
- The feasibility of obtaining all the prerequisite agreements to access lands (private and public) for installation of the facilities is likely low, and the ability to do so within the project time requirements adds a significant risk to implementation.
- Although the alternative approach is conceptually feasible to implement, the amount of time needed to construct the associated facilities within the project time requirements is uncertain.

For the reasons stated above, the transport of soil by overland conveyor and rail was eliminated from further consideration.

#### 2.4.2.4 Option to Build a New Road Eliminated

NASA considered building a new road for use by heavy vehicles accessing and leaving SSFL. Woolsey Canyon Road is the only road accessing the site that is capable of carrying heavy construction-type vehicles. Although NASA considered the potential for constructing a new access road to SSFL, alternative access was dismissed from further consideration for the following reasons:

- Construction of a new road would introduce new environmental and social impacts that would be avoided by using the existing access road.
- The timing for obtaining access agreements, permitting, and constructing a new access road before the proposed demolition and environmental cleanup activities began would preclude NASA's ability to meet its commitments to environmental cleanup responsibilities and to prepare the property for disposition on the project schedule.

As a result, the alternative action to build a new access road to SSFL was eliminated from further consideration.

## 2.5 Resources Eliminated from Further Consideration

This EIS focuses on key issues identified through the scoping and public involvement process. CEQ guidelines state that a NEPA analysis should be proportional to the potential for effect. Table 2.5-1 lists the resources evaluated and eliminated from further consideration because the Proposed Action and Action Alternatives would not significantly affect these resources.

TABLE 2.5-1
**Resources Eliminated from Further Consideration**
*NASA SSFL EIS for the Proposed Demolition and Environmental Cleanup*

| Resources Eliminated | Justification for Elimination |
|---|---|
| Land Use | The proposed demolition and environmental cleanup activities would not result in a change in land use on the NASA-administered property; implementation of the Proposed Action or action alternatives would not require a change in zoning, and no easements or land encroachments would be necessary. No land use acquisitions or transfers would be required. Existing and proposed land uses do not conflict with federal or state land use plans, policies, regulations, or laws. Therefore, no impacts to land use would occur. |
| Reclaimed Water System Infrastructure | The reclaimed water system on the NASA-administered property, once primarily used for noise suppression and some cooling of the test stands during engine testing, currently is inactive. Portions of the reclaimed water system within the Ash Pile/Sewage Treatment Plant (STP); Coca/Delta Fuel Farm; and Alfa, Bravo, Coca, Delta, and R-2 Ponds Areas transect areas proposed for environmental cleanup. Because this system currently is not used, there would be no negative impact from removing portions of piping prior to environmental cleanup activities. |
| Critical Habitat | Critical habitat includes geographic areas considered by the U.S. Fish and Wildlife Service (USFWS) to contain the physical or biological features that are essential for the conservation of a listed species and that might need special management or protection. Federal agencies are required to avoid “destruction” or adverse modification of designated critical habitat under the Endangered Species Act. There is no designated critical habitat within the NASA-administrated areas of the project site (USFWS, 2011).<br>Other types of sensitive and protected habitat are discussed in Sections 3.4 and 4.4 of this EIS. |
| Particulate Matter Hot Spot | Los Angeles County, located within the South Coast Air Basin under jurisdiction of the South Coast Air Quality Management District (SCAQMD), is classified as a federal nonattainment area for particulate matter having an aerodynamic equivalent diameter of 10 microns or less ($PM_{10}$) and particulate matter having an aerodynamic equivalent diameter of 2.5 microns or less ($PM_{2.5}$). Kern and Kings counties, located within the San Joaquin Valley Air Basin under jurisdiction of the SJVAPCD, are classified as federal maintenance areas for $PM_{10}$ and federal nonattainment areas for $PM_{2.5}$.<br>The Proposed Action and action alternatives are not highway or transit projects, and therefore, are not subject to California Transportation Conformity regulations. However, due to the required increase in diesel trucks for equipment and material transport, the $PM_{10}$ and $PM_{2.5}$ hot-spot analyses specified by the EPA’s *Transportation Conformity Guidance for Quantitative Hot-spot Analyses in $PM_{2.5}$ and $PM_{10}$ Nonattainment and Maintenance Areas* (2010b) were used to evaluate the potential particulate matter hot-spot impacts.<br>EPA specifies in 40 93.123(b)(1) that only “projects of air quality concern” are required to undergo a $PM_{2.5}$ and $PM_{10}$ hot-spot analysis. EPA defines projects of air quality concern as certain highway and transit projects that involve significant levels of diesel traffic or any other project that is identified by the $PM_{2.5}$ SIP as a localized air quality concern.<br>According to the definition of a project of air quality concern, as provided in 40 CFR 98.123(b)(1), if the Proposed Action and action alternatives considered were highway or transit projects, they would not be projects of air quality concern. Therefore, a detailed particulate matter hot-spot analysis would not be required, because the proposed activities would not cause a particulate matter hot-spot. |
| Mobile Source Air Toxics | In response to the Clean Air Act Amendments of 1990, EPA identified specific compounds with significant contributions from mobile sources that are among the national and regional-scale cancer risk drivers from their 1999 National Air Toxics Assessment (EPA, 2010a). EPA set standards for fuel composition, vehicle exhaust emissions, and evaporative losses from portable containers.<br>Although the Proposed Action and action alternatives would result in an increase in truck traffic due to the additional haul truck trips, the increase would be expected to be less than 80 truck trips per day and the existing roadways have an annual average daily traffic rate of less than 150,000. This accounts for a maximum increase of 4 percent truck traffic as a result of the proposed demolition and environmental cleanup activities. As a result, in accordance to the *Federal Highway Administration Memorandum: Interim Guidance Update on Mobile Source Air Toxic Analysis in NEPA [National Environmental Policy Act] Documents* (FHWA, 2009), the project activities would be expected to have no potential for a meaningful mobile source air toxin impact, and no additional analysis was performed. |

TABLE 2.5-1
**Resources Eliminated from Further Consideration**
*NASA SSFL EIS for the Proposed Demolition and Environmental Cleanup*

| Resources Eliminated | Justification for Elimination |
|---|---|
| Flooding | Federal Emergency Management Agency has not published flood insurance rate maps for the SSFL area; therefore no flood plains are identified specifically as being present at the project site. In addition, no nearby areas are designated as special flood hazard areas; therefore, it is unlikely that the project site would be affected by or subject to flooding. However, during major storm events, localized flooding could occur and ephemeral washes could overflow. |
| Geology | Demolition and environmental cleanup activities would not involve removal of bedrock. The Chatsworth Formation, which underlies the alluvium throughout the site, is unlikely to be affected. No demolition or environmental cleanup activities would affect the stratigraphic section (which defines the formation and therefore is a significant geological resource) of the Chatsworth Formation (Colburn et al., 1981) or any other significant geologic feature of this formation, because rock outcrops and unweathered bedrock would be avoided. As such, there would be no impact on geology.<br>Potential impacts to soils and other geologic resources are evaluated in Sections 3.7 and 4.2 of this EIS. |
| Seismicity | Numerous faults exist within the NASA-administered property of SSFL, but these likely represent Miocene-age faults (MWH, 2007c) and do not appear to have been active in the past 10 thousand years (CGS, 2007). Although earthquakes occurring along nearby faults have the potential to cause strong ground shaking on the NASA-administered property (CGS, 2007), the structures constructed as part of the remediation systems (for example, fencing, landfills, wells, and pump houses) would be small and unlikely to be affected adversely by such ground shaking. Furthermore, proposed demolition would remove the potential for demolished structures to be affected and would reduce or eliminate the potential for humans to be affected. The potential exposure to hazards related to seismic events (earthquakes) would be diminished or eliminated by the demolition of onsite structures. Finally, there would be no impacts expected from seismicity for any of the soil or groundwater remediation technologies. |
| Mineral Resources | There are no mineral resources present on the NASA-administered property at SSFL. |
| Socioeconomics | The Proposed Action and action alternatives would not induce, directly or indirectly, population growth or cause the displacement of existing residents or housing. Therefore, there would be no increase in school enrollment, demand for public transportation, or other population-related impacts. (Section 4.5 provides a full discussion of impacts to transportation resources.) The construction workforce within Ventura and Los Angeles counties is sufficient to meet the demand for the proposed demolition and environmental cleanup activities, and no appreciable migration of construction workers from outside this area would be expected. The small onsite construction workforce could result in a negligible increase in demand for public safety services, such as police protection provided by the Ventura County Sheriff's Department or fire and emergency medical services provided by the Ventura County Fire Department, which would be well within existing capacities. Therefore, the Proposed Action and action alternatives would have negligible adverse impacts on socioeconomic conditions. |
| Effects around Designated Landfills and Disposal Facilities | As described in Sections 2.2.1.4 and 2.2.2.2, numerous disposal facilities licensed to accept certain types of waste were identified. Air emissions associated with truck hauling between SSFL and the disposal facilities is analyzed and discussed in Section 4.7. Because the siting and licensing of these facilities includes consideration of the potential effects of bringing designated and permitted waste to the site, potential impacts of traffic safety, roadway conditions, noise, or environmental justice were not analyzed in detail. Furthermore, roadways near landfill locations were not considered in the detailed analysis as the project-related traffic volume, once outside of the vicinity of SSFL, would dissipate in route to various disposal facilities.<br>Before hauling material to a facility, NASA would confirm acceptance of specific waste. Consideration by the facility includes method and volume of disposal. This impact was considered and found to be negligible. |
| Bicycle and Pedestrian Operations | Within the primary region of influence, pedestrian facilities are provided along Topanga Canyon Boulevard, Roscoe Boulevard, Plummer Street, and portions of Valley Circle Boulevard. The addition of trucks from the remediation activities to these three roadways is within the acceptable loss of service operation criteria (Section 4.5). In addition, these roadways have designated sidewalks, crosswalks, and bicycle pathways (Roscoe Boulevard) for pedestrian use. Currently, there is no pedestrian access to the main project site entrance. Proposed and alternative activities would not affect these operations. |

TABLE 2.5-1
**Resources Eliminated from Further Consideration**
*NASA SSFL EIS for the Proposed Demolition and Environmental Cleanup*

| Resources Eliminated | Justification for Elimination |
|---|---|
| Railroads and Airports | The Amtrak Pacific Surfliner (Amtrak, 2012), operating between San Luis Obispo and San Diego; Amtrak Coast Starlight, operating between Seattle and Los Angeles; and Metrolink Ventura County Line (Metrolink, 2012), operating between East Ventura and L.A Union Station, are the only passenger rail operators in the project vicinity. The nearest station is the Simi Valley Station, approximately 2.5 miles north of the project site.<br>The nearest intermodal (freight) rail yard to SSFL is the Los Angeles Transportation Center, in Los Angeles County approximately 35.5 miles southeast of SSFL, which is operated by Union Pacific Railroad. The next closest intermodal rail yard is the Burlington North Santa Fe Hobart rail yard in Commerce, California, which is approximately 38 miles southeast of SSFL.<br>The nearest airport to SSFL is the Van Nuys Airport, approximately 10.5 miles to the east. The Van Nuys Airport averages 1,381 aircraft operations per day.<br>There is no potential for effect on railroad or airport operations. |

## 2.6 Schedule of Soil and Groundwater Remedial Activities

The 2010 AOC mandates that NASA complete soil remediation at SSFL and remove soils by the end of 2017. Soils characterization should be complete by mid-2014, followed by reporting and developing remedial action implementation plans and designs. Implementation of the soil remedial actions should occur in 2016 and 2017.

NASA is continuing to collect groundwater data based on the initial results of the RFI and RIs (NASA, 2009a; 2009b; 2008b; MWH, 2007b; 2009a, 2009b). These investigations are scheduled for planning and implementation through 2016. Groundwater response actions should occur in 2016 and 2017, with long-term groundwater O&M following.

SECTION 3

# Affected Environment

## 3.1 Introduction

This section provides an overview of the existing physical, biological, social, and economic conditions that occur within the NASA-administered portion of SSFL that potentially would be affected by the Proposed Action. In compliance with the National Environmental Policy Act (NEPA) and the NASA Procedural Requirements for implementing NEPA, the description of the affected environment focuses on those resources and conditions potentially subject to impacts from the Proposed Action or other alternative actions considered.

This section is organized by resource area (for example, biological resources, traffic, or environmental justice) and describes the existing environment. The region of influence (ROI), for the purpose of this analysis, is the NASA-administered portion of SSFL in which the proposed activities would occur, unless described otherwise in each resource area.

## 3.2 Site Infrastructure and Utilities

This subsection describes the site infrastructure at the NASA-administered areas of SSFL, including existing buildings and structures along with associated utility infrastructure. The ROI for the site infrastructure analysis includes the area of SSFL administered by NASA. Although buildings and structures discussed in this subsection are within the NASA-administered boundaries of the site, utilities extend into adjacent property belonging to the Boeing Company (Boeing).

The paved road system at SSFL is considered part of the site roadway infrastructure; however, it is discussed along with the transportation concerns and impacts in Section 3.10 of this report.

### 3.2.1 Existing Buildings

Table 3.2-1 summarizes the existing buildings and structures in the NASA-administered area of SSFL. Most of the buildings within NASA's areas are inactive. Confirmed through a review of aerial photography, most buildings within the NASA administered areas were constructed between the late 1950s and the mid-1960s. Currently, Building 2203 is used daily by NASA personnel and NASA contractors, and is the only NASA-administered building identified as active. Other existing buildings either are empty or store miscellaneous office equipment. Some of the structures in and around the four test stand areas also contain electrical control equipment, although the equipment is dilapidated and portions of the electronics appear to have been removed. Currently, the existing abandoned buildings appear to be structurally sound; however, they appear weathered, because routine maintenance no longer is conducted on these buildings. In 2007, NASA surveyed and evaluated certain existing structures for eligibility for listing in the National Register of Historic Places (NRHP); Section 3.3 provides a more detailed discussion of historic properties at SSFL.

TABLE 3.2-1
**Summary of Existing Utilities and Infrastructure at SSFL by Area**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Area | Existing Buildings | Storage Tanks[a] | Potable Water | Natural Gas | Sewer | Electrical | Communications | Test Support |
|---|---|---|---|---|---|---|---|---|
| Liquid Oxygen (LOX) Plant | Weigh station (number unknown) | X[b] | X | X | | X | X | |
| Area II Landfill | | X | | X | | | | |
| Expendable Launch Vehicle | 2201, 2202, 2203, 2206, 2207, 2211, 2231, 2232, 2509 | X | X | X | X | X | X | |
| Area II Ash Pile/ Sewage Treatment Plant | 2515, 2776 | X | X | | X | X | X | |
| Building 204 | 2204, 2204A, 2205, 2233, 2760, 2796 | X | X | X | X | X | X | |
| Storable Propellant Area | 2769, 2777, 2925, 2926, 2927, 2928 | X | | | | X | X | |
| Alfa/Bravo Fuel Farm | 2507, 2R, 2S, 2T | X | | | X | X | X | X |
| Alfa | 2208, 2208A, 2209, 2209A, 2212, 2212S, 2212B, 2727, 2727A, 2729, 2729A, 2739, 2X, 2Y | X | X | | X | X | X | X |
| Bravo | 2213, 2214, 2214A, 2730, 2730A, 2731, 2731A, 2732, 2Z | X | X | | X | X | X | X |
| Skyline Drive | 2711, 2818-2829 | X | X | | | X | X | X |
| Propellant Load Facility | | | X | | X | X | X | X |
| Coca | 2218, 2219, 2219D, 2222, 2235, 2236, 2237, 2239, 2240, 2241, 2451, 2520, 2614, 2733, 2734, 2743A, 2787, 2919, 2933, 2A, 2B, 2E, 2F, V99, V100, V108 | X | X | | X | X | X | X |
| Delta | 2223, 2225, 2601, 2H, 2J, 2K | X | X | | X | X | X | X |
| Coca/Delta Fuel Farm | | | X | | | X | X | X |
| R-2 Ponds | | X | | | | X | | X |

Notes
[a] Tanks column includes aboveground and underground storage tanks (including inactive septic tanks), and unknown tanks (tanks identified in legacy documents or have been observed in the field).
[b] Location of the LOX Plant Area septic tank and leach field has not been confirmed to date.

A number of aboveground storage tanks (ASTs) and underground storage tanks (USTs) are present at the site. Table 3.2-1 provides a summary as to where tanks are present at SSFL. A thorough historical document review, photography review, and site reconnaissance was completed and is presented in the Sitewide Inventory of Tanks (NASA, 2012a). Tanks of unknown application and/or identification status are included in the Sitewide Inventory and also are included in the impact analysis in this report.

## 3.2.2 Utilities and Infrastructure

This subsection addresses utilities that currently serve operational buildings at SSFL, as well as utilities that are no longer used and remain abandoned in place. These utilities include potable water service, natural gas distribution, sewer systems, electrical service, and communications. The focus of this utilities discussion is within the NASA-administered areas, which include Area I (LOX Plant Area) and all of Area II, although utility infrastructure generally is sitewide and supplies utility services to both NASA and Boeing. Table 3.2-1 provides a summary of where the utility infrastructure serves the NASA-administered area.

### 3.2.2.1 Potable Water System

Ventura County Waterworks supplies potable water to SSFL. Water pumped to SSFL from Simi Valley enters SSFL from the east near the main entrance gate. Water is then directed to 4 of the 10 ASTs on Skyline Drive, which is a topographical high-point ridge for the NASA-administered areas. The potable water supply lines provide potable water directly to various buildings throughout the NASA-administered area. According to invoices provided by Ventura County Waterworks, approximately 2.5 million gallons of potable water were used at SSFL from May 2012 to May 2013. The volumetric percentage directly used by NASA staff and NASA contractors is not monitored separately. The potable water supply primarily is used for sanitation and dust control purposes. Onsite personnel use portable 5-gallon drinking water dispensers for drinking water purposes.

Potable water is diverted to the single Alfa Fresh (potable) Water Tank for use within Area II, then supplied from the Alfa Fresh (potable) Water Tank to NASA-administered areas via gravity in a closed-loop system (NASA, 2011c). Figure 3.2-1 provides an overview of the potable water system within the NASA-administered areas.

### 3.2.2.2 Natural Gas System

Southern California Gas Company supplies natural gas to SSFL. As described in the Natural Gas Pipeline GIS Feature Class technical memorandum (MWH, 2012a, p. 4):

> *The main pipeline running from northeast Area I to the western boundary of Santa Susana is located completely underground. In northeast Area I, the natural gas pipeline connecting to buildings/storage tanks within the…RFI/RI sites has been severed but remains in place. The complete extent of the gas line has yet to be determined. According to site personnel, the natural gas line extends beyond the site boundaries on both the east and west ends, and will therefore remain active after Santa Susana is closed because it also serves the surrounding communities*.

Natural gas entering the facility from the western boundary supplies Area II, the NASA-administered areas, through the main line along Service Area Road, south of the Building 204 Area. The Building 204 and Expendable Launch Vehicle (ELV) areas currently are supplied with natural gas for heating purposes; the natural gas delivery system would be disconnected during demolition activities in these areas. The natural gas main also runs along the southern edge of the Area II Landfill and former LOX Plant site in Area I; the gas main might be affected in these areas only if road maintenance or construction were required.

The Natural Gas Pipeline GIS Feature Class technical memorandum continues (MWH, 2012a, p. 4):

> *The pipeline trends southwest into Area IV, connecting to the Building 064 Leach Field (B064 LF) and New Conservation Yard (NCY) RFI/RI sites. Further west in Area IV, the pipeline follows G Street, branches to the north, and connects to buildings/storage tanks along the northern portion of the site including RFI/RI Sites. The pipeline in this area has been severed but remains in place. A southern spur of the pipeline leads to the Engineering Chemistry Laboratory (ECL) and east to a building east of Silvernale Reservoir has been severed from the main line but remains in place*.

This report does not contain a figure depicting the natural gas line infrastructure. Potential impacts to the natural gas pipelines would be addressed, where applicable, if earthmoving remedial actions were to begin.

#### 3.2.2.3 Sewer System

Septic tanks and their associated leach line fields were used at SSFL until approximately 1960, when an integrated sewer system was installed and implemented. As detailed in the Sanitary Sewer Geographical Information System (GIS) Feature Class technical memorandum (MWH, 2012a, p. 6):

> *Three sewage treatment plants provided treatment for most of the sanitary sewer waste at Santa Susana: the Area I Sewage Treatment Plant (STP-1), the Area II STP (STP-2), and the Area III STP (STP-3). STP-3 also treated sanitary sewage from operations within Area IV, and Area II beginning in 1987...When STP-2 was in operation, it received both sanitary sewage and cooling water discharges from small air conditioning and heat exchanger units in Area II–from the Building 204 and ELV RFI/RI Sites to the north, and from the Alfa and Bravo RFI/RI Sites to the south. The STP was designed to treat 50,000 gallons per day (gpd), but received an average flow of approximately 4,000 gpd. The unit is below grade and concrete lined.*

These STPs (except STP-3 [demolished]) currently serve as holding areas from which sewage waste is transported offsite for disposal (NASA, 2010a). Figure 3.2-2 shows the locations of the sewer lines and leach and septic system infrastructure.

#### 3.2.2.4 Electrical System

Southern California Edison provides electricity to SSFL from the Chatsworth Substation in Chatsworth, California. Additionally, a Southern California Edison-owned substation is northwest of the Building 204 Area, on Boeing-owned property. Electricity currently is not supplied to or has been disconnected from most buildings; however, inactive transfer lines and transformers still exist. Figure 3.2-3 shows the locations of identified electrical substations and transformers. Electrical distribution infrastructure exists and leads to each of the NASA-administered remedial investigation (RI) areas except for the Area II Landfill site. Currently, NASA only uses electricity at Building 2203; this building is used for office space and as a field office for environmental contractors. Electrical breakers are turned off to other NASA-administered buildings at SSFL.

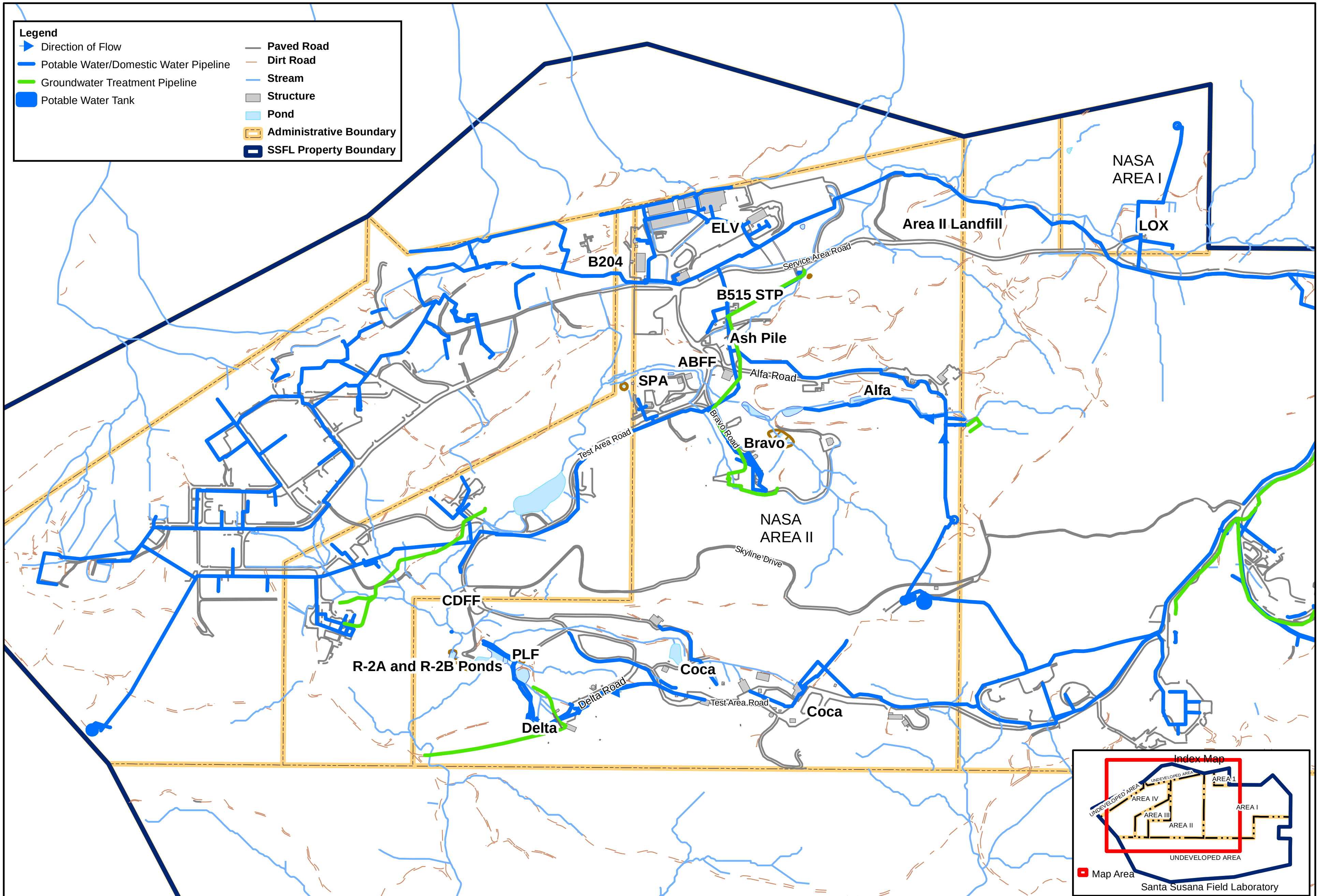
#### 3.2.2.5 Communication System

AT&T provided digital data and telephone service to SSFL. Currently, Boeing operates the communication services sitewide, including the NASA-administered areas, and owns the physical communication infrastructure onsite. The data and telephone services are used for communications. The communication infrastructure did support current SSFL security and fire monitoring; however, since Boeing has begun demolition on its property at SSFL, these systems have been deactivated. Certain remediation systems include a remote communication system to notify the operator if a system component is out of range, not operating properly, or, in other situations, to allow operators to check system status. Communications infrastructure is located throughout the NASA-administered area, except in the Area II Landfill and the R-2 Ponds areas.

#### 3.2.2.6 Test Support Systems

Test support systems refer to SSFL-specific utilities historically used to support testing activities. LOX, liquid nitrogen, helium, nitrogen, hydrogen, and petroleum-based fuels were used within NASA-administered areas. The reclaimed water system also is grouped into the “test support systems” category, because its primary function was for cooling while SSFL was operated as a testing facility. The test areas are inactive and testing fuels, gases, and cooling water are no longer stored or used; however, infrastructure used to transport these materials mostly is intact. Most of this infrastructure is at or close to the Alfa, Bravo, and Coca Test Areas.

Infrastructure used to transport petroleum-based fuels from the Alfa/Bravo (tanks and piping) and Coca/Delta (piping only) Fuel Farms to their respective testing areas exists and mostly is intact, and an investigation of unidentified and unmarked pipes at the facility is ongoing. These systems were not supported by offsite infrastructure; the onsite infrastructure could be affected during the proposed remedial activities.

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09-Mar-2012
Drawn By:
A. Cooley
D. Scott Stevens

**Figure 3.2-1**
**Potable Water Supply System**
**NASA - Santa Susana Field Laboratory**
**EIS for Proposed Demolition and Environmental Cleanup**

Map Document: O:\NASA\SSFL\maps\EIS_2011\EIS_Basemap_WaterSupply.mxd

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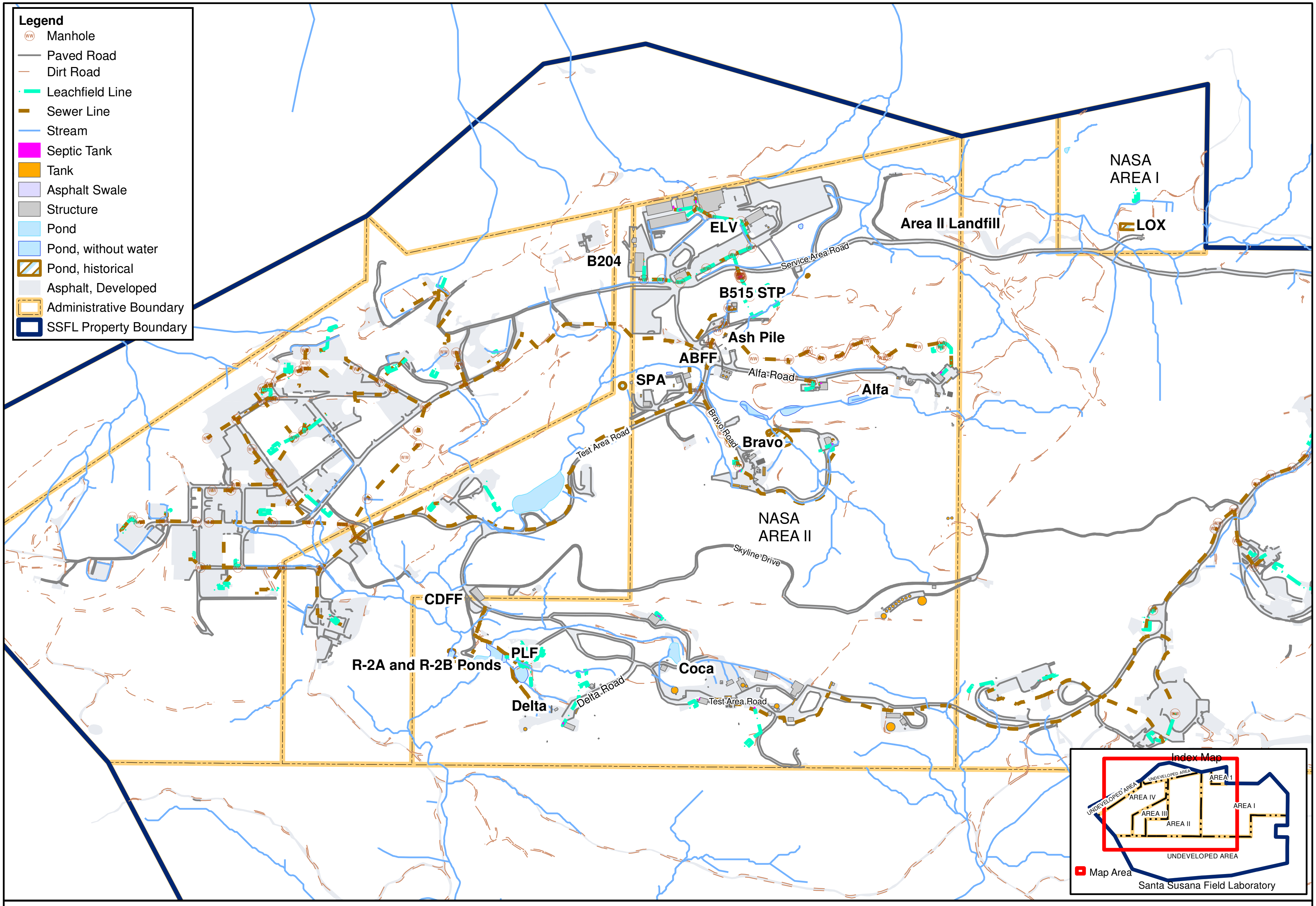


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A. Cooley
D. Scott Stevens

**Figure 3.2-2**
**Sewer Lines and Leach/Septic Tank System**
**NASA - Santa Susana Field Laboratory**
**EIS for Proposed Demolition and Environmental Cleanup**

Map Document: O:\NASA\SSFL\maps\EIS_2011\EIS_Basemap_Sewer.mxd

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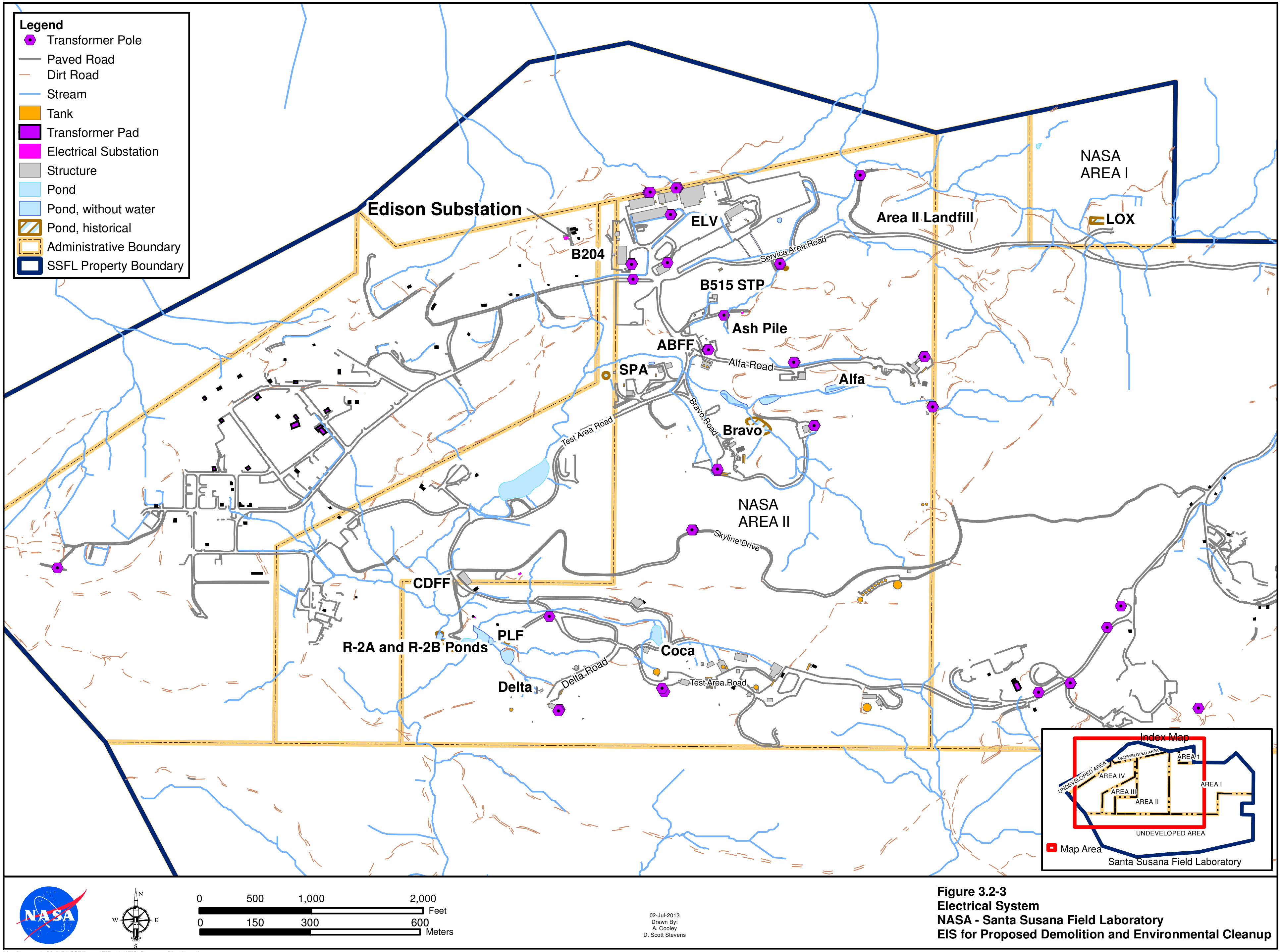


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A. Cooley
D. Scott Stevens

**Figure 3.2-3**
**Electrical System**
**NASA - Santa Susana Field Laboratory**
**EIS for Proposed Demolition and Environmental Cleanup**

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# 3.3 Cultural Resources

Federal agencies are required to protect and preserve cultural resources in cooperation with state and local governments under numerous federal statutes including NEPA, the Archeological Resources Protection Act and the National Historic Preservation Act (NHPA) of 1966 as amended (16 United States Code 470, Public Law 95-5 15). Cultural resources is a broad term that includes prehistoric and historic archeological sites, districts, and objects; historic structures, buildings, districts, and objects; locations associated with important historic events; and sites of traditional or cultural importance to various groups, including Indian Sacred Sites. "Historic property" is defined in 36 *Code of Federal Regulations* (CFR) 800 as any prehistoric or historic district, site, building, structure, or object listed in, or eligible for listing in, the NRHP. The term includes properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meet the NRHP criteria. In this context, the term historic property is used to indicate significant cultural resources.

The ROI for cultural resources encompasses the NASA-administered portion of SSFL and areas extending outside the NASA boundary that are projected to have ground disturbance from the project cleanup activities (as shown in Figure 2.2-2). The ROI, also referred to as the area of potential effects (APE) for the purposes of Section 106 compliance under NHPA, is shown in Figure 3.3-1. The APE is defined as the area in which the direct and indirect effects of a project might cause alterations to the character of historic properties. There is a possibility that the final footprint of the soil remediation areas may go beyond the existing APE. If this happens, the APE would be adjusted and previously unsurveyed areas that could be affected by the cleanup would be surveyed for cultural resources.

The criteria used under NHPA to evaluate properties for NRHP eligibility are provided in 36 CFR 60, National Register of Historic Places. A resource must meet one or more of these criteria to be considered for eligibility:

- Be associated with events that have made a significant contribution to the broad patterns of history (Criterion A).
- Be associated with the lives of persons significant to our past (Criterion B).
- Embody the distinctive characteristics of a type, period, or method of construction, or represent the work of a master, possess high artistic values, or represent a significant and distinguishable entity whose components might lack individual distinction (Criterion C).
- Have yielded, or have the potential to yield, information important to prehistory or history (Criterion D).

Generally, properties must be 50 years old to be eligible for the NRHP, but those that have achieved significance within the past 50 years might be eligible under Criteria Consideration G, which states that a property achieving significance within the last 50 years can be eligible if it is of exceptional importance.

In addition to meeting one or more of these criteria, a resource must retain integrity to be considered eligible for listing in the NRHP. Integrity is the authenticity of the physical identity, as evidenced by the survival of characteristics that existed during the resource's period of significance. Historic properties must retain enough of their historic character or appearance to be recognizable and to convey the reasons for their significance. The seven aspects of integrity, presented in 36 CFR 60, are location, design, setting, materials, workmanship, feeling, and association.

A resource that has lost its historic character or appearance and is not eligible for the NRHP still might have sufficient integrity for the California Register of Historical Resources (CRHR) if it maintains the potential to yield significant scientific or historic information or specific data. The CRHR is used as a guide by State and local agencies, private groups, and citizens to identify State historical resources and to decide which properties are to be protected, to the extent prudent and feasible, from substantial adverse change. The CRHR, as instituted by the California Public Resources Code, automatically includes those California properties already listed in the NRHP.

The CRHR follows the lead of the NRHP in using the general 50-year threshold. A resource usually is considered for its historic significance after it reaches the age of 50 years. This threshold is not absolute, and was selected as a reasonable span of time after which a professional evaluation of historic value or importance can be made.

Appendix C of this EIS, *Cultural Resources Study for Environmental Cleanup and Demolition at Santa Susana Field Laboratory, NASA Areas I and II, Ventura, California* (NASA, 2013), contains more detailed information regarding the cultural resources, the ROI (APE), the identified historic properties within the ROI, and the consultation process required under NEPA and Section 106 of NHPA.

## 3.3.1 Archival Research

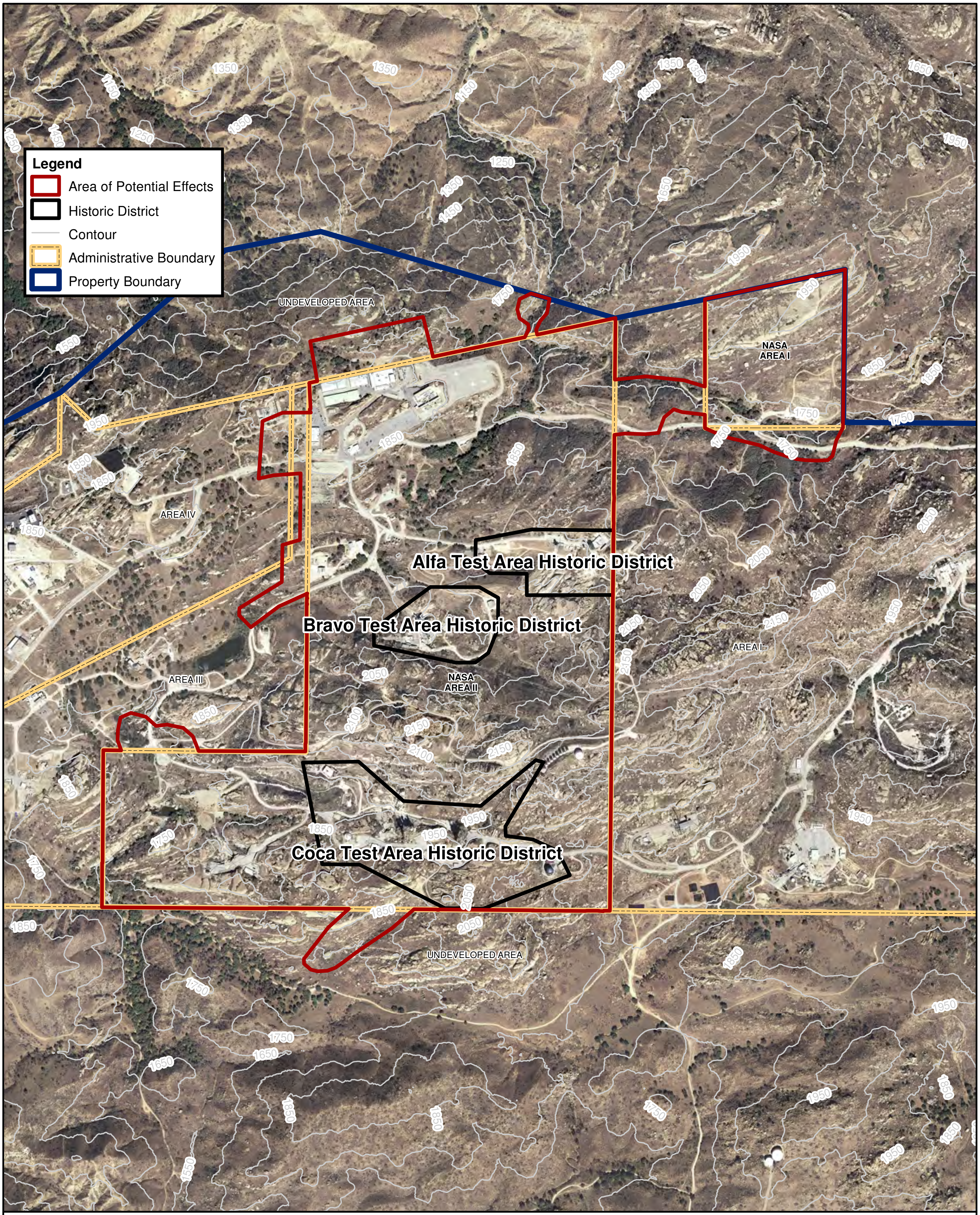
NASA conducted a literature search in 2006 at the California Historical Resources Information System (CHRIS) South Central Coastal Information Center (SCCIC) at California State University–Fullerton for SSFL. In support of this EIS, an updated literature search was conducted on July 12, 2011, for the NASA-administered portion of SSFL; a 1-mile area around the NASA-administered property at SSFL was included in this study area. A subsequent records search was conducted at SCCIC in February 2013 for additional area on Boeing property that might require soil cleanup as part of this action.

The literature searches conducted at the SCCIC provided data resulting from previous cultural resources studies within the APE and within a 1mile buffer around the APE. A total of 18 previous studies have been conducted wholly or partially within the ROI (APE) from 1959 to the present. These previous reports were used to investigate previously identified historic properties, as well as for historic context research.

The available data at the SCCIC indicated that three previously identified, NRHP-listed or -eligible archeological sites are located within the ROI (APE). Surveys focusing on architectural resources have identified three NRHP-eligible historic districts within SSFL (Archaeological Consultants, Inc. [ACI], and Weitze Research [WR], 2009), as well as nine individually NRHP-eligible properties within the boundaries of the districts. Table 3.3-1 lists the identified historic properties within the ROI, specifically within Area II. Each of these resources is discussed in the following subsections.

TABLE 3.3-1
**Identified Historic Properties in the Region of Influence**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Site Description | NRHP/CRHR |
|---|---|
| Burro Flats | NRHP-Listed; CRHR-Listed |
| Archeological Site 1 | Potentially NRHP-Eligible |
| Archeological Site 2 | Potentially NRHP-Eligible |
| Alfa Test Area Historic District | NRHP-Eligible |
| Bravo Test Area Historic District | NRHP-Eligible |
| Coca Test Area Historic District | NRHP-Eligible |

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26-Jun-2013
Drawn By:
A. Cooley

**Figure 3.3-1**
**Area of Potential Effects**
**NASA - Santa Susana Field Laboratory**
**EIS for Proposed Demolition and Environmental Cleanup**

Map Document: O:\NASA\SSFL\maps\EIS_2011\EIS_APE.mxd

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### 3.3.2 Biological Species with Native American Cultural Uses

NASA submitted to the Santa Ynez Band of Chumash Indians, a federally recognized tribe, the SSFL 2011 biological inventory of species for comments about historically used flora and fauna found on SFFL. Six plants and five animals were identified as having known cultural uses by the Santa Ynez Band of Chumash Indians. This topic is covered in greater detail under Section 3.4, Biological Resources.

### 3.3.3 Cultural Resources Identified

Cultural resources include prehistoric and historic archeological sites, districts, and objects; historic structures, buildings, districts, and objects; properties associated with significant events; and sites of traditional or cultural importance, including Indian Sacred Sites. An historic property, as described previously, is any prehistoric or historic district, site, building, structure, or object listed in, or eligible for listing in, the NRHP, indicating that the property is a significant cultural resource. The cultural resources discussed in this subsection include Indian Sacred Sites, Traditional Cultural Properties (TCPs), and archeological and architectural resources.

Although numerous studies were carried out by archeologists and anthropologists working in the SSFL area in the latter half of the 20th century, NASA conducted cultural resource inventories of the NASA-administered portion of SSFL in 2007, 2008, 2009, and 2011. These inventories covered the entirety of the NASA-administered portion of SSFL and some areas outside this area that might need to be remediated.

#### 3.3.3.1 Indian Sacred Sites

In December 2012, NASA received notice from the Santa Ynez Band of Chumash Indians of the tribe's designation of SSFL as an Indian Sacred Site (Santa Ynez Band of Chumash Indians, 2012), including NASA's portion, in accordance with Executive Order (EO) 13007 (1996). This EO states that, for lands designated as sacred sites, agencies managing federal lands shall:

(1) Accommodate access to and ceremonial use of Indian Sacred Sites by Indian religious practitioners and

(2) Avoid adversely affecting the physical integrity of such sacred sites. Where appropriate, agencies shall maintain the confidentiality of sacred sites.

The boundaries of the Santa Ynez Band of Chumash Indians' Sacred Site are still to be determined; NASA is limited by the EO from disclosure of the Sacred Site boundaries. For the purposes of this EIS, NASA has assumed that the boundary for the Sacred Site encompasses all of NASA's portion of SSFL. Consultation with the Santa Ynez Band of Chumash Indians is ongoing regarding the proposed action and the impacts to the designated Indian Sacred Site.

#### 3.3.3.2 Traditional Cultural Properties and Cultural Landscapes

TCPs can include cultural use areas such as harvesting sites, cemeteries, or religious sites, and their significance is derived from the role the property plays in the community's historically rooted beliefs, customs, and practices and for the purposes of this EIS, a TCP is synonymous with a place of traditional religious and cultural importance to Native Americans, as referenced in 36 CFR 800.

To identify any additional historic properties, specifically TCPs and cultural landscapes, NASA commissioned a traditional cultural properties and cultural landscape assessment for SSFL and vicinity. The goal of this assessment was to investigate the existence and extent of a potential TCP and to assess the potential for a significant cultural landscape. This was a preliminary investigation, meaning that the majority of the historic context and ethnographic information came from existing documentation. The other element of the assessment was to conduct interviews with local individuals to ascertain the current and previous ethnohistoric use of the region and the influence of flora and fauna in area development. Authorities who were consulted included knowledgeable individuals within the different Native American communities with ties to the region, as well as specialists in ethnography, history, anthropology, and archeology. The assessment identified a TCP. For the purposes of Section 106, and in consultation with the Santa Ynez, NASA is treating the whole of the NASA-administered area of SSFL as a TCP. Investigations found no 20th century cultural landscapes that would meet the criteria for eligibility for listing in the NRHP.

### 3.3.3.3 Archeological Resources

Along with the archival research, intensive, Phase I, systematic pedestrian archeological resource surveys were conducted from 2007 through 2011 within the APE. These surveys resulted in archeological survey of 100 percent of NASA-administered lands at SSFL, as well as additional areas outside the NASA-administered areas where cleanup might be required, for a total survey area of 490 acres.

Archeological field surveys were completed to satisfy both federal and state requirements. Federal requirements for conducting an archaeological survey are primarily outlined in Section 106 of the NHPA and the Secretary of the Interior's Standards and Guidelines for Identification. California state guidelines are outlined in CEQA, Public Resources Code Section 5097.2, and CEQA Guidelines Section 15064.5. Archeological survey methodologies were consistent with professional standards and in accordance with common practice for such studies in the state of California.

The following subsections describe the three archeological sites found within the ROI through the surveys and archival research.

The first archeological survey within the ROI was conducted in June 2007, followed by another investigation in February 2008, of NASA's LOX Plant Area I and Area II (Emmick and Bard, 2008). Methodologies for these field investigations employed the use of site records to relocate known resources and mapping using global positioning system units. Pedestrian transects alternated between 50 feet (ft) and 100 ft because of uneven, steeply sloped terrain. To complete the surface inventory of the APE, a Phase I pedestrian archeological resource survey of an additional 75 acres within the NASA-administered property at SSFL was conducted in October 2011. In low, flat areas where pedestrian navigation was feasible, transects spaced at 15-meter (49.2-ft) intervals were conducted. Areas with greater than a 25 percent slope were surveyed differently, as equally spaced transects were not feasible in these steep areas. Therefore, in areas where the slope was greater than 25 percent and the terrain was unsafe for regular pedestrian survey, an opportunistic reconnaissance level survey was employed.

**Burro Flats**

Burro Flats was listed in the NRHP, as well as in the CRHR, in May 1976. The Burro Flats site was first recorded in 1959 (Rozaire, 1959). At that time, NRHP significance criteria had not been developed. The NRHP website indicates that the site is significant for its informational potential, which today would be Criterion D (NRHP, 2013).Researchers John Romani and Albert Knight described the site as an astronomical observatory and associated it with the celebration of the solstices (Knight, 2012). The Chumash of the Simi Valley and Simi Hills and the Gabrieleño of the San Fernando Valley, as well as the Tataviam, might have visited the Burro Flats area. The site encompasses approximately 10 acres in the NASA-administered area of SSFL. The period of significance of the cave is believed to be 1000 to 1499 A.D. To protect the cave, its exact location is confidential and access to the site is highly restricted.

The earliest documented investigations at Burro Flats began in 1953, with excavations carried out by the Archaeological Survey Association of Southern California, which made five trips to the site between 1953 and 1954. The site was formally recorded and limited excavations were completed by Rozaire in 1959 and 1960 (Rozaire, 1959). The site was listed in the NRHP in 1976, largely because of Dr. Clement Meighan from the University of California, Los Angeles. In 1991, 10 site numbers were combined into one site by Albert Knight (Knight, 1991). The site was visited again in 2006 and 2007 by W&S Consultants for the express purpose of cataloguing the condition of the rock art. In 2007, NASA revisited the site during pedestrian surveys conducted in Areas I and II. NASA identified no new features at the site, but did record universal transverse Mercators for most of the features previously recorded at the site on NASA-administered property. California Department of Parks and Recreation forms were completed for the site to report the newly recorded universal transverse Mercators (Emmick and Bard, 2008).

**Archeological Site 1**

During a 2008 survey, archeologists located a previously unrecorded prehistoric site in Area II. The site appears to have been affected in the recent past by wildfire and wind and water erosion, and might have been subject to looting, although there was no visible evidence of unauthorized excavation. Nevertheless, the rock shelter site was deemed to retain integrity of location, design, setting, materials, and workmanship.

The site was recommended as potentially eligible for the NRHP under Criterion D pending further study, because of its potential to yield information important to prehistory. The State Historic Preservation Officer (SHPO) reviewed this recommendation as part of Section 110 consultation in February 2009. At that time, SHPO did not concur with the finding that Archeological Site 1 was eligible for the NRHP. Until additional investigations were carried out, SHPO recommended the site be treated as potentially eligible for all undertakings. NASA agreed with this recommendation in April 2009. Archeological Site 1 does not lie within any of the activity areas under the Proposed Action.

**Archeological Site 2**

In 2010, a cultural resources assessment was completed on Boeing property. The assessment included a literature search and a pedestrian survey. One archeological site was identified during this investigation, extending a few meters into the ROI; 0.01 acre of the site is within the ROI. Much of the ground visibility in the area is limited by thick vegetation. The site is in good condition and there is a possibility that the site has an intact subsurface component (Hogan and Tang, 2010).

The site is recommended potentially eligible for listing in the NRHP under Criterion D, pending further study, because of its potential to yield information important to prehistory. The SHPO has not yet reviewed this recommendation. A small portion of this site, 0.01 acre, falls within NASA's possible cleanup area.

**Archeological District**

The three archaeological sites recorded within the APE do not meet the criteria established by the National Park Service (NPS) to be considered an archaeological district. Each site contains unique and unconnected constituents with no clear linkage or continuity between them. To be considered a district, archaeological sites must possess "a significant concentration, linkage, or continuity of sites, buildings, structures, or objects united historically or aesthetically by plan or physical development" (NPS, 2000). Also, as stated in Bulletin 36, "A district derives its importance from being a unified entity, even though it is often composed of a wide variety of resources. The identity of a district results from the interrelationship of its resources, which can convey a visual sense of the overall historic environment or be an arrangement of historically or functionally related properties." These three archaeological sites do not readily meet any of these criteria.

#### 3.3.3.4 Architectural Resources

A historic resources survey conducted in January 2008 included a review and reconnaissance of the 139 federally owned buildings, structures, and sites within Area II of SSFL. With the exception of wells and a truck scale, no other structures are located within Area I (LOX Plant Area). The archival research and field survey resulted in the recordation of three historic districts–the Alfa, Bravo, and Coca Test Area Historic Districts–recommended eligible for listing in the NRHP. Within these three historic districts, six test stands and three associated control houses (Buildings 208, 213, and 218) were recommended as each individually meeting the NRHP criteria for eligibility in the contexts of the Cold War (Military) and Space Exploration, circa mid-1950s to 1991. They were recommended eligible under Criterion A for their exceptionally important role in the development and testing of various rocket engines, and under Criterion C for their specialized engineering and design. Because they have achieved exceptional importance within the past 50 years, Criteria Consideration G applies. The SHPO concurred with the eligibility of these three districts and their contributing elements, as well as with the individual eligibility of the nine structures, on May 15, 2008.

Table 3.3-2 lists the buildings and structures that have been determined individually eligible and/or contributing elements to a historic district at SSFL.

**Alfa Test Area Historic District**

The NRHP-eligible Alfa Test Area Historic District contains 18 buildings, 10 of which are contributing resources to the district. The two test stands and control house also have been determined individually eligible for listing in the

NRHP (Table 3.3-2). The district includes the test stands and control house, two observation structures, a terminal house, standtalker shack, electrical control stations, and elements of the natural and constructed landscape.

Constructed during 1954-1955, the Alfa Test Area featured the first cluster of operational static test stands at SSFL. The Alfa Test Area supported early rocket engine static testing and provided pivotal data for the development and improvement of many weapons and space vehicle booster systems, which makes it eligible for the NRHP under Criterion A for its role in the development and testing of rocket engines. The Alfa Test Area Historic District also is eligible under Criterion C for the design and engineering of the test area structures by the Los Angeles architectural-engineering firm of Daniel, Mann, Johnson, and Mendenhall (DMJM), with the assistance of Walter Riedel.

TABLE 3.3-2
**Historic Structures and Districts in the NASA-administered Areas at Santa Susana Field Laboratory**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Structure No. | Structure Name | NRHP Status | |
|---|---|---|---|
| | | Individually Eligible | Contributes to a Historic District |
| **Alfa Test Area Historic District** | | | |
| 2208 | Alfa Control House | X | X |
| 2209 | Alfa Terminal House | | X |
| 2727 | Alfa I Test Stand | X | X |
| 2727A | Alfa I Electrical Control Station | | X |
| 2729 | Alfa III Test Stand | X | X |
| 2729A | Alfa III Electrical Control Station | | X |
| 2739 | Standtalker Shack | | X |
| 2X | Alfa Observation Structure (Pill Box) | | X |
| 2Y | Alfa Observation Structure (Pill Box) | | X |
| | Alfa Landscape/Spillway | | X |
| **Bravo Test Area Historic District** | | | |
| 2213 | Bravo Control House | X | X |
| 2214 | Bravo Terminal House | | X |
| 2730 | Bravo I Test Stand | X | X |
| 2730A | Bravo I Electrical Control Station | | X |
| 2731 | Bravo II Test Stand | X | X |
| 2731A | Bravo II Electrical Control Station | | X |
| 2Z | Bravo Observation Structure (Pill Box) | | X |
| | Bravo Landscape/Spillway | | X |
| **Coca Test Area Historic District** | | | |
| 2218 | Coca Control Center | X | X |
| 2222 | Coca Pre-Test Building | | X |
| 2235 | Coca Electrical Control Station (LOX) | | X |

TABLE 3.3-2
**Historic Structures and Districts in the NASA-administered Areas at Santa Susana Field Laboratory**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Structure No. | Structure Name | NRHP Status | |
|---|---|---|---|
| | | Individually Eligible | Contributes to a Historic District |
| 2236 | Coca Electrical Control Station (LH2) | | X |
| 2237 | Coca $GH_2$ Compressor Building | | X |
| 2239 | Coca $GH_2$ Compressor Building | | X |
| 2241 | Coca Pump House | | X |
| 2520 | Coca High Pressure $GH_2$ and $GN_2$ Vault | | X |
| 2614 | Coca IV Observation Structure (Pill Box) | | X |
| 2733 | Coca I Test Stand | X | X |
| 2787 | Coca IV Test Stand | X | X |
| 2A | Coca North Observation Structure (Pill Box) | | X |
| 2B | Coca Observation Structure (Pill Box) | | X |
| V99 | Coca $GH_2$ Vessel | | X |
| V100 | Coca LH2 Vessel #1 | | X |
| V108 | Coca LOX Vessel #1 | | X |
| | Coca Cable Tunnel | | X |
| | Coca Landscape/Spillway | | X |

Notes:
$GH_2$ = gaseous hydrogen
$GN_2$ = gaseous nitrogen
LH2 = liquid hydrogen

## Bravo Test Area Historic District

The NRHP-eligible Bravo Test Area Historic District contains 10 buildings, 8 of which are contributing resources to the district. The test stands and control house also have been determined individually eligible for listing in the NRHP (Table 3.3-2). The district also includes one observation structure, a terminal house, electrical control stations, and elements of the natural and constructed landscape.

Constructed during 1955-1956, the Bravo Test Area featured the second operational cluster of static test stands for Air Force Plant 57 at SSFL. Under Criterion A, it is eligible due to its associations with multiple static engine tests run between 1956 and 1991, beginning with tests of Atlas thrust chambers in 1956, and also due to supporting the testing of F-1 components, Lunar Module Rocket Engine assemblies, and Atlas and Delta RS-27 vernier engines and turbo pumps. Like the Alfa Test Area, the Bravo Test Area Historic District also is eligible under Criterion C for the design and engineering of the test area by the Los Angeles architectural-engineering firm of DMJM, with the assistance of Walter Riedel.

## Coca Test Area Historic District

The NRHP-eligible Coca Test Area Historic District contains 27 buildings and structures, 18 of which are contributing resources to the district. Three properties in the district, two test stands and the control center, also have been determined individually eligible for listing in the NRHP (Table 3.3-2). The district includes the Coca I and Coca IV Test Stands, control center, three observation structures, a pre-test building, electrical control stations, compressor buildings, a pump house, a cable tunnel, and other auxiliary structures, as well as elements of the natural and constructed landscape.

Originally constructed during 1955-1956, the Coca Test Area featured the third operational cluster of static test stands for Air Force Plant 57 at SSFL. Some of the facilities were modified or redesigned between 1962 and 1964; additional facilities were built between 1972 and 1978. Under Criterion A, the Coca Test Area Historic District is eligible due to its associations with multiple static engine tests run between 1956 and 1988, beginning with tests of Atlas and Navaho engines in the late 1950s; the J-2 engine in the 1960s in support of Saturn/Apollo; and the Space Shuttle Main Engine in the 1970s and 1980s in support of the Space Shuttle Program. Like the Alfa and Bravo Test Areas, the Coca Test Area Historic District also is eligible under Criterion C for the design and engineering of the test area by the Los Angeles architectural-engineering firm of DMJM, with the assistance of Walter Riedel.

# 3.4 Biological Resources

Biological resources, in the context of this EIS, refer to vegetation communities, wildlife, sensitive species, weed species, and wetlands occurring on the NASA-administered portion of SSFL. The ROI for biological resources is generally the NASA-administered property at SSFL (Areas I [LOX Plant] and Area II); however, when necessary, a broader overview of the ecoregion or watershed is considered.

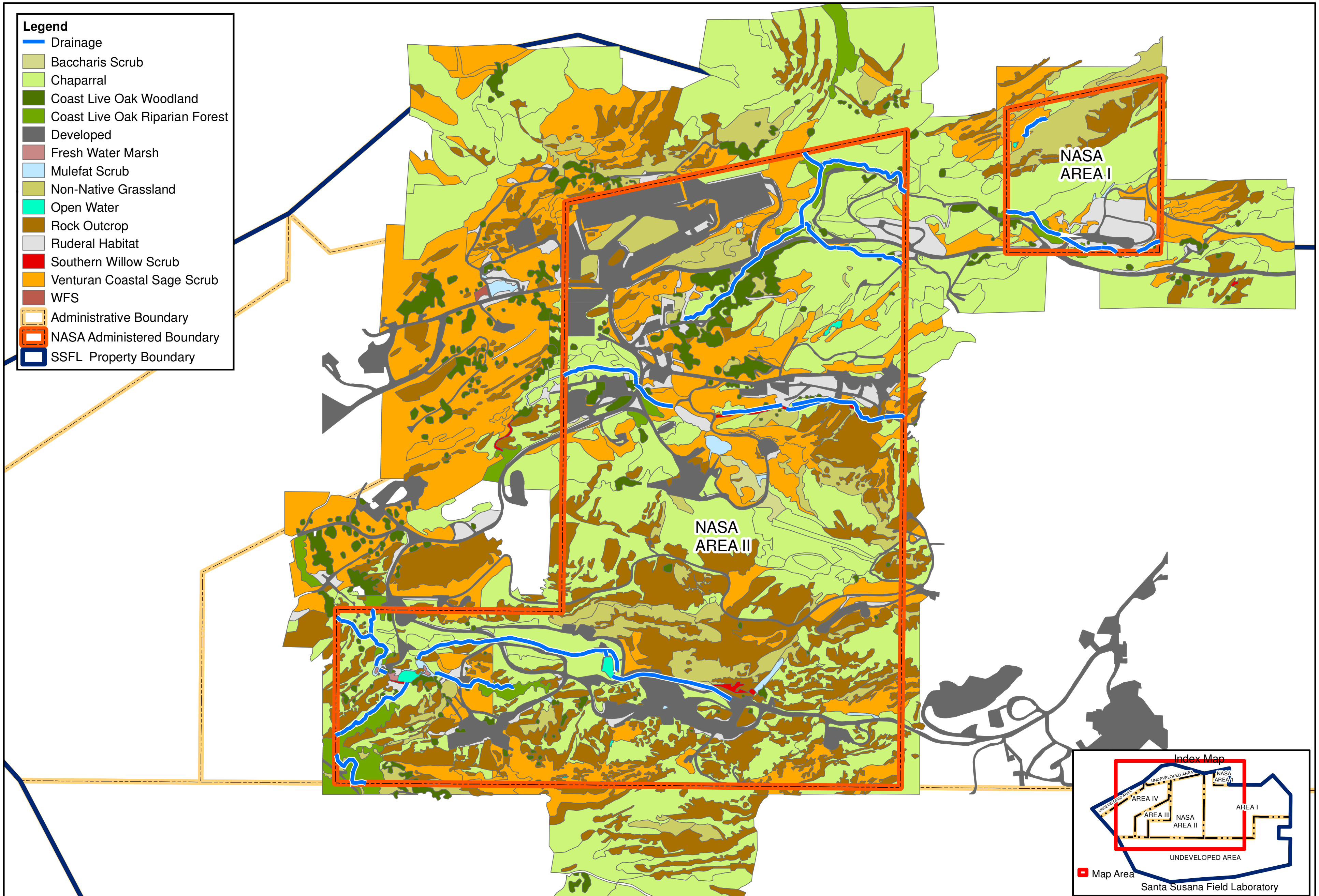
## 3.4.1 Vegetation and Land Cover Types

Approximately 230 acres of the NASA-administered property at SSFL consist of rock outcrops. The predominant natural plant communities within the ROI include California sagebrush, chaparral scrublands, and Coast Live Oak. The local distribution and density of plant communities vary substantially at SSFL due to differences in habitat quality and historical disturbances (such as development or wildfires). Table 3.4-1 lists the habitat types identified during the fall 2010 habitat mapping (NASA, 2011b) and Figure 3.4-1 shows the vegetative cover across the ROI and surrounding areas. Descriptions of these habitat types are provided in Appendix D in the Fall 2010 Habitat and Listed Species Survey Report (NASA, 2011b).

TABLE 3.4-1
**Habitat Types Identified on NASA-administered Property during Fall 2010 Surveys**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Natural Habitats | Acreage |
|---|---|
| Baccharis Scrub | 2.62 acres |
| Chaparral | 172.63 acres |
| Coast Live Oak Riparian Forest | 9.16 acres |
| Coast Live Oak Woodland | 13.22 acres |
| Freshwater Marsh | 0.17 acres |
| Mulefat Scrub | 2.09 acres |
| Non-native Grassland | 19.20 acres |
| Venturan coastal sage scrub | 64.44 acres |
| Southern willow scrub | 1.04 acres |
| **Non-Natural Habitats** | **Acreage** |
| Developed | 58.10 acres |
| Open Water | 0.41 acres |
| Ruderal | 16.75 acres |

Notes:
Estimated acreages are based on the dominant habitat type.
Source: NASA (2011b)




0 500 1,000 2,000 Feet

0 150 300 600 Meters

05-Apr-2013
Drawn By:
A. Cooley

**Figure 3.4-1**
**Vegetation Cover Types**
**NASA - Santa Susana Field Laboratory**
**EIS for Proposed Demolition and Environmental Cleanup**

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### 3.4.2 Wildlife and Migration Linkages

Wildlife species were identified during the fall 2010 survey (NASA, 2011b) within the NASA-administered portion of SSFL via sightings, calls, and other evidence of occurrence. Identifications during the surveys included 10 butterfly species, 11 reptile and amphibian species, 59 bird species, and at least 14 mammal species. The common vertebrate wildlife species include mule deer (*Odocoileus hemionus californicus*), coyote (*Canis latrans),* turkey vulture (*Cathartes aura*), common raven (*Corvus corax*), and western rattlesnake (*Crotalus oreganus helleri*). Numerous common invertebrate species were observed, including butterflies and dragonflies; Appendixes D and E, respectively, provide detailed descriptions of the observed wildlife.

SSFL habitat and species diversity, physical attributes, and geographic location make the area a potentially important route for species migrations. Open space at SSFL could play a role for habitat linkage among the Santa Susana Mountains, the Simi Hills, and possibly, the Santa Monica Mountains (NASA, 2011b). Species observed using the migration linkage through SSFL include mountain lion, badger, and mule deer, although potential habitat exists for many other species as well (South Coast Wildlands, 2008). While the NASA-administered portions of SSFL are outside of the critical habitat linkages in the region (Figure 3.4-2), wildlife species may still use the NASA-administered areas during migrations and as a habitat linkage.

### 3.4.3 Sensitive Species

For the purpose of this EIS, “sensitive species” refer to plants or animals that are either listed by the U.S. Fish and Wildlife Service (USFWS) or by the California Department of Fish and Wildlife (CDFW) as threatened, endangered, or that could be listed in the foreseeable future. An “endangered” species is one in danger of extinction throughout all or a significant portion of its range, while a “threatened” species is one likely to become endangered within the foreseeable future. If a species does not meet the qualifications to be a state or federally listed species, it still could be considered a “sensitive species” if it meets the USFWS requirements for “candidate” or for the CDFW’s “rare” or “Species of Special Concern (SSC)” classifications.

#### 3.4.3.1 Sensitive Plant Species

The USFWS has identified eight threatened or endangered listed plant species that potentially are located within the SSFL ROI (USFWS, 2012). Table 3.4-2 lists these species. General and species-specific surveys were conducted within the ROI during 2010 and 2011; however, no federally listed plant species were found (NASA, 2011b; 2011d). Braunton’s milk-vetch (*Astragulus brauntonii*)) and its critical habitat does occur within Area IV and the undeveloped areas of SSFL, administered by the U.S. Department of Energy (DOE). Consequently, targeted surveys for Braunton’s milk-vetch were conducted on the NASA-administered properties of SSFL during the 2010 and 2011 surveys. No Braunton’s milk-vetch were observed within the ROI. Soil conditions indicate that suitable habitat may exist in the northeastern portion of Area II and the southern portion of Area I.

Only one state-listed special-status plant species was documented within the NASA-administrated properties (NASA, 2011b; 2011d). The Santa Susana tarplant (*Deinandra minthornii*) is state-listed as rare. Santa Susana tarplants were observed in numerous locations throughout the NASA-administered properties (Figure 3.4-3) and generally were associated with the sandstone outcrops. The vast majority (91 percent) of the identified plants found at SSFL were in Area II (NASA, 2011b). Santa Susana tarplant populations are distributed throughout Ventura and Los Angeles counties and numerous samples of Santa Susana tarplant have been found off of the SSFL site (Baldwin, et al., 2012).

#### 3.4.3.2 Sensitive Wildlife Species

The USFWS has identified seven threatened or endangered listed wildlife species that potentially are located on the NASA-administered portion of SSFL (USFWS, 2012). One state-listed species, one fully protected species, and nine SSC species have been identified within the vicinity of SSFL (NASA, 2011b; 2011d). Table 3.4-3 lists these species.

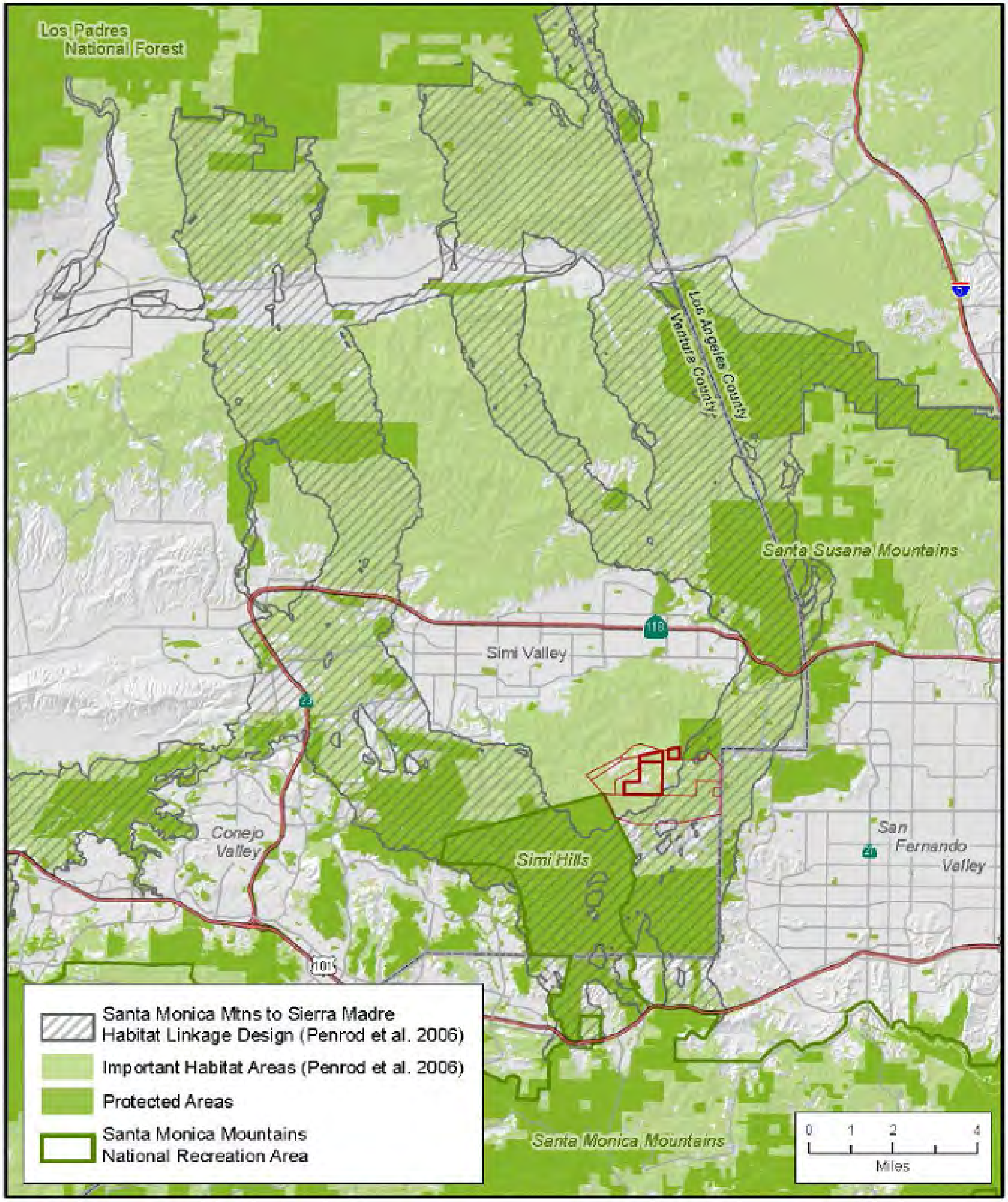
TABLE 3.4-2
**Sensitive Plant Species Potentially Located within SSFL**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Species Name | Agency | Designation | Identified in ROI? |
|---|---|---|---|
| Braunton's milk-vetch (*Astragalus brauntonii*) | USFWS | Endangered | No |
| Lyon's pentachaeta (*Pentachaeta lyonii*) | USFWS | Endangered | No |
| Spreading navarretia (*Navarretia fossalis*) | USFWS | Threatened | No |
| California orcutt grass (*Orcuttia californica*) | USFWS | Threatened | No |
| Conejo dudleya (*Dudleya parva*) | USFWS | Threatened | No |
| Agoura Hills dudleya (*Dudleya cymosa* spp. *agourensis*) | USFWS | Threatened | No |
| Santa Monica live-forever (*Dudleya cymosa* spp. *ovatifolia*) | USFWS | Threatened | No |
| Marcescent dudleya (*Dudleya cymosa* spp. *marcescens*) | USFWS | Threatened | No |
| Santa Susana tarplant (*Deinandra minthornii*) | CDFW | Rare | Yes |
| Conejo buckwheat (*Erigonum crocatum*) | CDFW | Rare | No |
| San Fernando spine flower (*Chorizanthe parryi* var. *fernandina)* | CDFW | Endangered | No |
| Sources: USFWS (2012); NASA (2011b; 2011d) | | | |

Of the federally listed species, only the Least Bell's vireo (*Vireo bellii pusillus*) was observed during the 2011 survey (NASA, 2011d). A single Least Bell's vireo was sighted during the August 2011 survey, as shown in Figure 3.4-4. This sighting occurred outside the typical breeding period; therefore, it might have been a transient moving through the area. Mule-fat, a favored plant of the Least Bell's vireo, exists on the site; however, the coverage of mule-fat scrub habitat is relatively limited (2.1 total acres) and fragmented. No Least Bell's vireos were observed or heard during surveys conducted during their breeding period and the closest reported nesting location occurs approximately 9 miles northwest of the site.

The Quino checkerspot butterfly (*Euphydryas editha quino*), which is federally listed as endangered, possibly was observed within the NASA-administered property and the butterfly's host plant, *Plantago erecta*, was observed in the ROI during the 2011 survey (NASA, 2011b). However, a subsequent survey by a qualified entomologist indicated that the potential habitat was marginal at best, and no butterfly specimens were observed (ECS, 2012; Appendix F).

The California red-legged frog (*Rana draytonii*) is federally listed as threatened and known to occur south of NASA-administered portions of SSFL in Las Virgenes Canyon and upper Las Virgenes Creek. A habitat assessment was conducted on NASA-administered portions of the property in 2012 in accordance with USFWS guidance, and opportunistic surveys were conducted in 2010, 2011, and 2012. No evidence of California red-legged frog occurrence was found during any of these surveys. There is limited potential suitable habitat for this frog species on the NASA-administered property, primarily around the R-2 Ponds and the Coca Skim Pond.




0 0.5 1 2 Miles
0 0.751.5 3 Kilometers

24-Feb-2014
Drawn By:
A. Cooley

**Figure 3.4-2**
**Wildlife Migration Linkage**
**NASA - Santa Susana Field Laboratory**
**EIS for Proposed Demolition and Environmental Cleanup**

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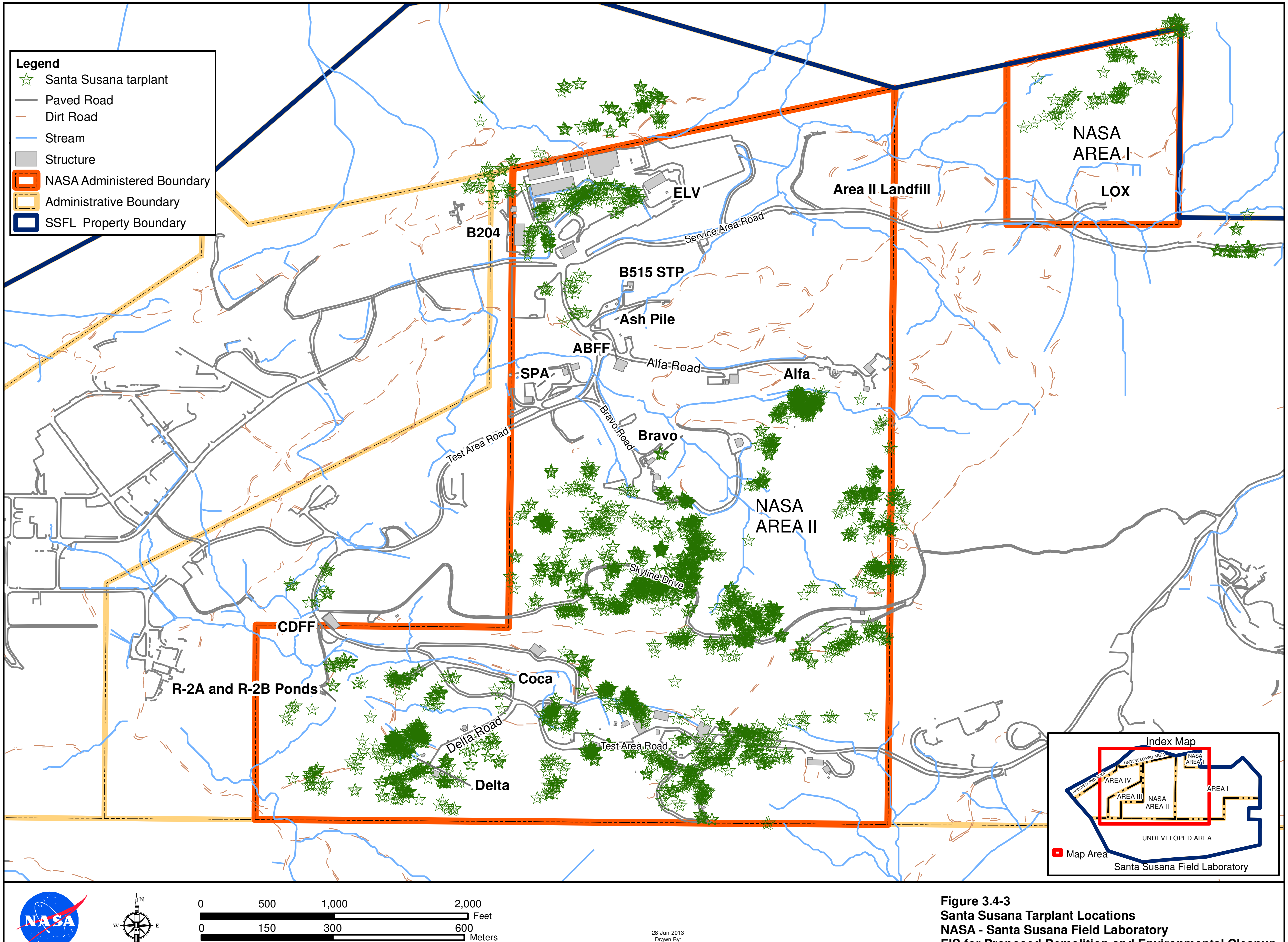


**Figure 3.4-3**
**Santa Susana Tarplant Locations**
**NASA - Santa Susana Field Laboratory**
**EIS for Proposed Demolition and Environmental Cleanup**

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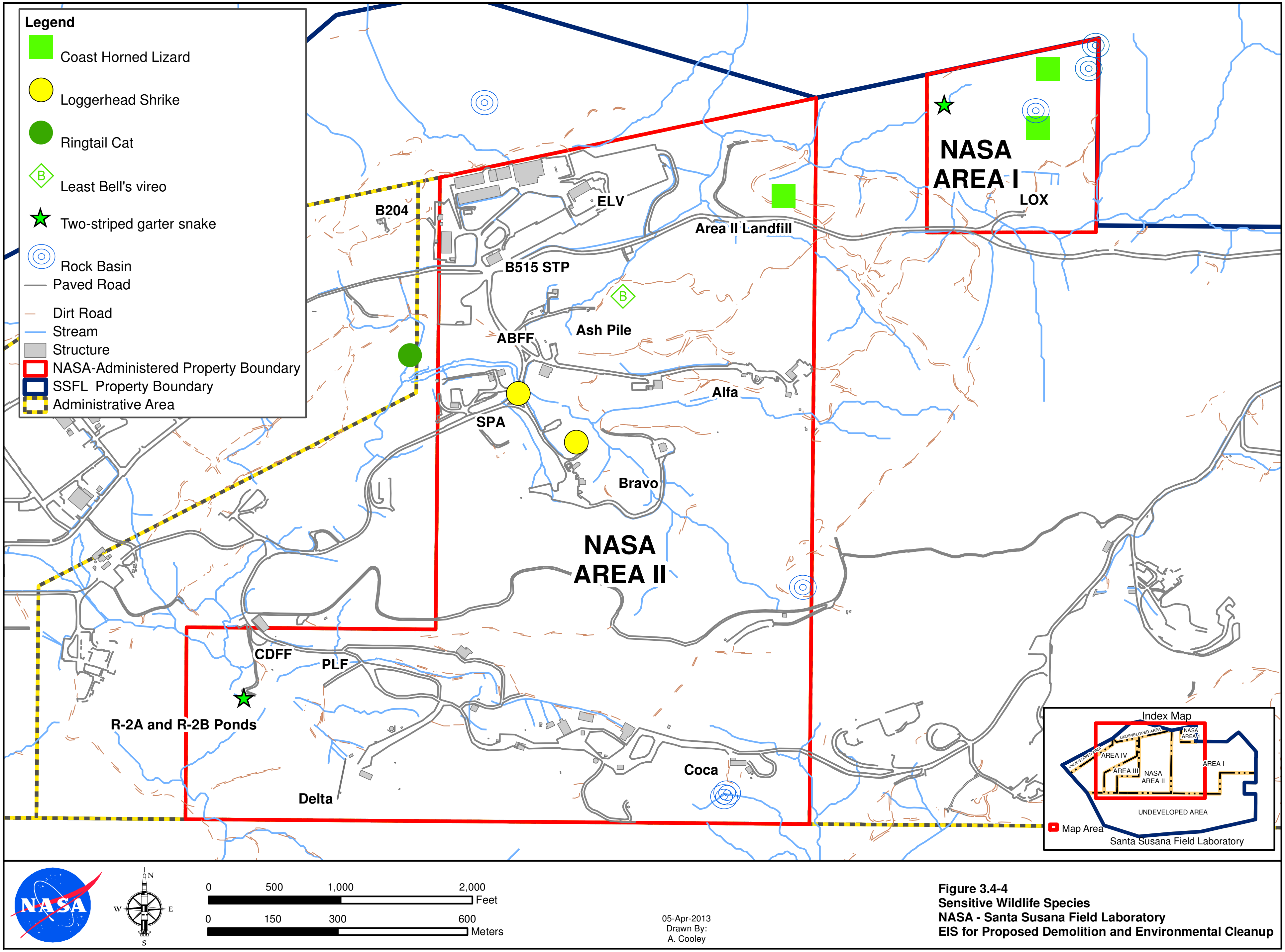


**Figure 3.4-4**
**Sensitive Wildlife Species**
**NASA - Santa Susana Field Laboratory**
**EIS for Proposed Demolition and Environmental Cleanup**

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TABLE 3.4-3
**Sensitive Wildlife Species List**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Species Name | Animal Class | Agency | Designation | Identified in ROI? |
|---|---|---|---|---|
| Least Bell's vireo (*Vireo bellii pusillus*) | Bird | USFWS/CDFW | Endangered | Yes |
| Arroyo toad (*Bufo californicus*) | Amphibian | USFWS | Endangered | No |
| California red-legged frog (*Rana draytonii*) | Amphibian | USFWS | Threatened | No |
| Coastal California gnatcatcher (*Polioptila californica californica*) | Bird | USFWS | Threatened | No |
| Quino checkerspot butterfly (*Euphydryas editha quino*) | Insect | USFWS | Endangered | Potentially |
| Riverside fairy shrimp (*Streptocephalus woottoni*) | Crustaceans | USFWS | Endangered | Potentially |
| Vernal pool fairy shrimp (*Branchinecta lynchi*) | Crustaceans | USFWS | Threatened | Potentially |
| Arroyo toad (*Anaxyrus californicus*) | Amphibian | CDFW | SSC | No |
| Coast horned lizard (*Phrynosoma coronatum* [*blainvillii* population]) | Reptile | CDFW | SSC | Yes |
| Loggerhead shrike (*Lanius ludovicianus*) | Bird | CDFW | SSC | Yes |
| Ring-tailed cat (*Bassariscus astutus)* | Mammal | CDFW | Fully Protected | No |
| San Diego desert woodrat (*Neotoma lepida intermedia*) | Mammal | CDFW | SSC | No |
| Silvery Legless Lizard (*Anniella pulchra*) | Reptile | CDFW | SSC | No |
| Tricolored blackbird (*Agelaius tricolor*) | Bird | CDFW | SSC | No |
| Two-striped garter snake (Thamnophis hammondii) | Reptile | CDFW | SSC | Yes |
| Western mastiff bat (*Eumops perotis californicus*) | Mammal | CDFW | SSC | No |
| Western spadefoot toad (*Spea hammondii*) | Amphibian | CDFW | SSC | No |
| Sources: USFWS (2012); NASA (2011b; 2011d) | | | | |

Listed fairy shrimp species known to occur on pools in rock outcrops in southern California include the federally endangered Riverside fairy shrimp (*Streptocephalus woottoni*) and the federally threatened vernal pool fairy shrimp (*Branchinecta lynchi*). Basins and depressions on rock outcrops that are inundated during the wet season could support listed fairy shrimp species. During the 2010 and 2011 surveys, several basins on rock outcrops were sighted within the NASA-administered property; however, as confirmed during the 2012 wetlands delineation (Appendix G), the basins were not wet and positive identification was not possible. Although the species were not observed during the surveys, these species have the potential to occur within the ROI. The quality and quantity of suitable habitat appears to be very limited onsite, however.

Two SSC reptile species were observed within the NASA-administered property – the coast horned lizard (*Phrynosoma coronatum* [blainvillii population]) and the two-striped garter snake (*Thamnophis hammondii*). Three juvenile coast horned lizards were sighted during the 2010 and 2011 surveys (Figure 3.4-4). A two-striped garter snake was observed in the seasonal pond northwest of the former LOX Plant during the 2011 survey.

The SSC bird species sighted within the NASA-administered property at SSFL was the loggerhead shrike (*Lanis ludovicianus*). An individual loggerhead shrike was seen in Area II during the fall 2010 survey and one was sighted foraging at the Alfa test stand site (within Area II) during the August 2011 survey (Figure 3.4-4).

An individual ring-tailed cat (*Bassariscus astutus*), a CDFW fully protected mammal species, was sighted near the ROI on a rock outcrop near a riparian drainage adjacent to NASA's Area II (Figure 3.4-4).

### 3.4.3.3 High-priority Conservation Habitats

Two high-priority conservation natural habitats (southern willow scrub and Venturan coastal sage scrub), as defined by the CDFW, were identified and mapped on the NASA-administered property during the fall 2010 survey (NASA, 2011b). These habitats have been assigned a State ranking of either S2 (community is considered imperiled due to a restricted range, steep declines, or other factors making it vulnerable to extirpation [local extinction] from the State) or S3 (the habitat is considered vulnerable, with a moderate risk of extirpation due to a restricted range, recent declines, or other factors). Details about these habitats are as follows:

- **Southern willow scrub (S2)**. Southern willow scrub occurs along major rivers of coastal Southern California, but has been reduced by urban expansion, flood control and channel improvements (Holland, 1986). Southern willow scrub is relatively limited within the ROI (1.04 total acres) and is associated with seasonal drainages, as well as with more permanent water sources. Small areas of this habitat type were identified in Area II along the drainages north of the Area II landfill and the Coca Test Stand site, and around the R-2 Ponds and the Coca detention pond. The largest area of southern willow scrub on the NASA-administered property occurs along the drainage on the southern side of the Alfa Test Stand site (within Area II).
- **Venturan coastal sage scrub (S3)**. Venturan coastal sage scrub is one of three floristic provinces of coastal sage scrub, which occurs from Baja California to San Francisco. Venturan coastal sage scrub specifically occupies northern coastal areas to Point Conception and the Channel Islands (Davis, 1994). Venturan coastal sage scrub is widespread throughout SSFL (64.44 total acres). The largest areas of this habitat occur in the southwestern part of Area II. This habitat generally is intermixed with chaparral and rock outcrops.

No federally designated critical habitat exists within the NASA-administrated areas (USFWS, 2011).

### 3.4.3.4 Biological Species of Native American Concern

A number of plant and wildlife species found on SSFL have been identified as species of concern to Native American tribes. The list of species, the reason for their significance, and their distribution are provided in Table 3.4-4.

A search of the U.S. Department of Agriculture (USDA) *Plants Database* (USDA, 2013) and the California Native Plant Society's (CNPS) *Inventory of Rare, Threatened and Endangered Plants of California* (CNPS, 2013) was performed to determine the distribution and sensitivity of each of these plant species. None of these species is listed as rare, threatened, or endangered by the CNPS, CDFW, or USFWS. Furthermore, the distribution of each of these species extends beyond the boundaries of SSFL.

A search of the USFWS Endangered Species Database (USFWS, 2013) and Nature Serve Explorer (NatureServe, 2013) was performed to determine the distribution and sensitivity of these animal species. None of these species is listed by CDFW or USFWS as rare, threatened, or endangered. Furthermore, the distribution of each of these species extends beyond the boundaries of SSFL.

TABLE 3.4-4
**Biological Species of Native American Concern**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Scientific Name | Common Name | Concern | Distribution |
|---|---|---|---|
| **Plant Species** | | | |
| *Asclepias eriocarpa* | Broad leaved milkweed | Culturally recognized for material culture use and ceremonial use | California |
| *Asclepias fascicularis* | Narrow leaved milkweed | Culturally recognized for material culture use and ceremonial use | Western U.S. |
| *Amsinckia menziesii* | Common fiddleneck | Culturally recognized as a food source and ceremonial use | U.S. |
| *Marah macrocarpus* | Wild cucumber | Culturally recognized for material culture use, medicinal, edible and ceremonial use | Southern California |
| *Quercus agrifolia* | Coast live oak | Culturally recognized as a staple food source and ceremonial use | Coastal California |
| *Salvia columbariae* | Chia sage | Culturally recognized as a food source for ceremonial use | Western U.S. |
| **Animal Species** | | | |
| *Phrynosoma blainvillii* | Coast horned lizard | Culturally recognized in oral tradition and ceremonially recognized | Coastal California |
| *Melanerpes formicivorus* | Acorn woodpecker | Culturally recognized in oral tradition and ceremonially recognized | Western US |
| *Corvus brachyrhynchos* | American crow | Culturally recognized in oral tradition, song and ceremony | U.S. |
| *Corvus corax* | Common raven | Culturally recognized in oral tradition and ceremonially recognized | U.S. |
| *Geococcyzus californianus* | Greater roadrunner | Culturally recognized in oral tradition and ceremony | Western U.S. |
| Sources: SYBCI, 2011; USDA, 2013; NatureServe, 2013 | | | |

## 3.4.4 Noxious and Invasive Weeds

A noxious weed is a plant that has been defined as a pest plant by the U.S. Department of Agriculture or the California Department of Food and Agriculture (CDFA) (CDFA, 2011). Invasive weeds include species that present an economic or ecological threat, but are not subject to legal regulations.

Numerous noxious and invasive weed species have been identified within the ROI. Fourteen invasive plant species were identified on the NASA-administered property during the 2011 surveys. Five of the species identified are classified by CDFA as noxious weeds (NASA, 2011d). Table 3.4-5 lists the noxious and invasive weeds identified during the 2011 surveys; however, other noxious and invasive weeds could be present, as well.

TABLE 3.4-5
**Noxious and Invasive Weeds Identified on the NASA-administered Property at SSFL**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Scientific Name | Common Name | Type | Threat |
|---|---|---|---|
| *Ailanthus altissima* | Tree of heaven | Noxious | Moderate |
| *Brassica nigra* | Black mustard | Invasive | Moderate |
| *Bromus diandrus* | Ripgut brome | Invasive | Moderate |
| *Bromus madritensis* ssp. *rubens* | Red brome | Invasive | High |
| *Carduus pycnocephalus* | Italian plumeless thistle | Noxious | Moderate |
| *Centaurea melitensis* | Maltese star-thistle | Noxious | Moderate |
| *Cirsium vulgare* | Bull thistle | Noxious | Moderate |
| *Cynodon dactylon* | Bermudagrass | Invasive | Moderate |
| *Foeniculum vulgare* | Sweet fennel | Invasive | High |
| *Gazania linearis* | Treasureflower | Invasive | Moderate |
| *Mesembryanthemum crystallinum* | Common iceplant | Invasive | Moderate |
| *Pennisetum setaceum* | Crimson fountaingrass | Invasive | Moderate |
| *Salsola tragus* | Prickly Russian thistle | Noxious | Limited |
| *Vulpia myuros* ssp. *myuros* | Rat-tail fescue | Invasive | Moderate |
| Sources: CDFA (2011); Cal-IPC (2012) | | | |

## 3.4.5 Wetlands

Wetlands are ecological habitats protected under the federal Clean Water Act (CWA). Activities that have the potential to discharge fill materials into "waters of the United States," including wetlands, must be authorized by the U.S. Army Corps of Engineers (USACE) under Section 404 of the CWA. The USACE has identified a number of areas in the ROI as waters of the U.S. (USACE, 2013). NASA would obtain a CWA Section 404 permit for impacts to identified waters of the U.S. The following is a brief discussion of potential wetlands and waters of the U.S. within the ROI. USACE is responsible for determining the jurisdictional limits of waters of the U.S. subject to regulation under the federal CWA.

Non-wetland waters of the U.S. include features such as rivers, streams, lakes, and ponds. In the absence of adjacent wetlands, USACE jurisdiction extends to the limits of the ordinary high-water mark, which is defined as "the line on the shore established by fluctuations of water and indicated by physical characteristics such as a clear natural line impressed on the bank, shelving, changes in the character of the soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas" (33 CFR 328.3 [e]).

### 3.4.5.1 Wetland Delineation

Wetlands are defined as areas that are "inundated by surface water or groundwater with 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" (40 CFR 230.3 and 33 CFR 238). The survey methodology followed the *Wetland Delineation Manual* (Environmental Laboratory, 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region* (USACE, 2008).

As indicated by the results of the January 2012 wetland delineation (NASA, 2012b) and the USACE jurisdiction determination (USACE, 2013), a total 3.05 acres of wetlands are within the ROI, consisting of approximately 1.20 acres of palustrine (ponded) wetlands and 1.26 acres of riverine (stream-like) wetlands. There is also approximately 0.59 acre of constructed features (such as swales, asphalt drainage ditches, and culverts); however, because these features are fabricated and are not jurisdictional wetlands, they are not considered further. Figure 3.4-5 shows the locations of these wetlands.

Four separate ponds and basins make up the ROI palustrine wetlands, averaging 0.34 acre per feature. The largest features are the R2A and R2B ponds in the southwestern portion of the NASA-administered property. Eight separate drainages compose the Riverine wetlands, averaging 0.34 acre per feature. The largest drainages are the Northern Drainage, in the southern portion of Area I and northeastern portion of Area II; the Southwestern Drainage, in the central portion of Area II; and the Coca Drainage, in the south-central portion of Area II. Table 3.4-6 provides a summary of the wetland features identified during the January 2012 wetland delineation (NASA, 2012b).

Jurisdictional waters within the ROI include extant natural drainages, some of which have been realigned and lined with concrete. Furthermore, the R2A, R2B, and Coca ponds have been created along the natural drainage channels and therefore are considered either impoundments of waters of the U.S. or adjacent to waters of the U.S. (NASA, 2012b; USACE, 2013). NASA would obtain a CWA Section 404 permit from USACE for impacts to waters of the U.S.

TABLE 3.4-6
**Summary of Wetland Features**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Feature ID | Acreage |
|---|---|
| ***Palustrine Wetlands*** | |
| | |
| R2A Pond | 0.74 |
| R2B Pond | 0.13 |
| Coca Skim Pond | 0.33 |
| *Total Palustrine Wetlands* | *1.20* |
| ***Riverine Wetlands*** [a] | |
| Northern Drainage | 0.46 (2,176 LF) |
| ELV Drainage | 0.14 (862 LF) |
| Southwestern Drainage | 0.43 (8,420 LF) |
| Coca Drainage | 0.20 (655 LF) |
| | |
| | |
| Drainage A-2 | 0.03 (324 LF) |
| *Total Riverine Wetlands* | *1.26* (12,437 LF) |

Notes:
LF = linear foot
[a] The data shown include only natural wetlands.
Source: NASA (2012b)

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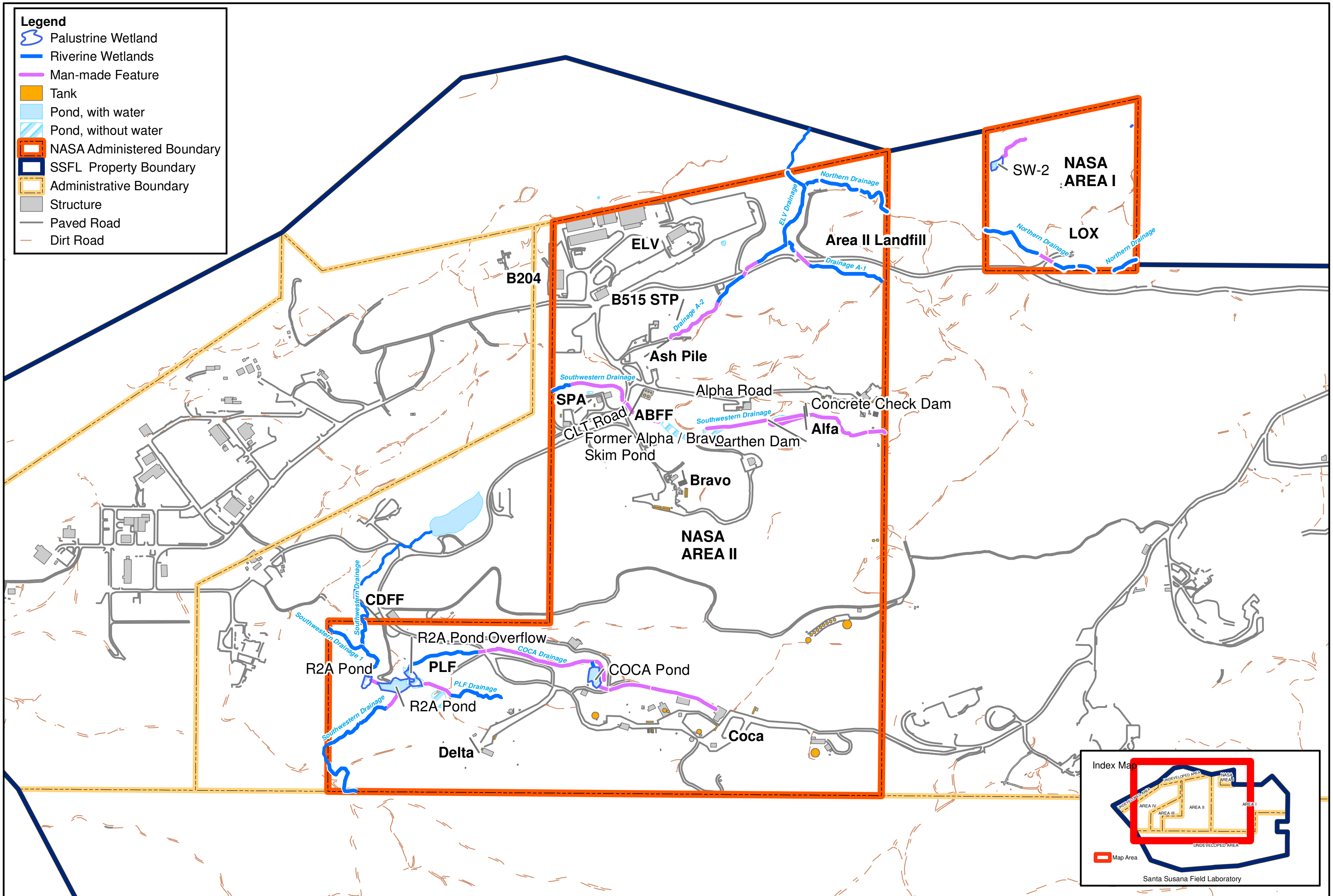


0 500 1,000 2,000 Feet

0 150 300 600 Meters

Wetland Delineation:
Russell Huddleston and Steve Long, January 2012

05-Apr-2013
Drawn By:
A. Cooley

**Figure 3.4-5**
**Wetlands**
**NASA - Santa Susana Field Laboratory**
**EIS for Proposed Demolition and Environmental Cleanup**

Map Document: O:\NASA\SSFL\maps\EIS_2011\EIS_WetlandsSvy.mxd

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# 3.5 Air Quality and Greenhouse Gas Emissions

This subsection provides a description of the environmental setting associated with the air quality and climate change for the area of the Proposed Action. The Proposed Action activities would occur primarily in Ventura and Los Angeles counties. However, truck traffic hauling excavated material might go to one of the landfills identified in Section 2.2.1.4, thus passing through the following counties: San Bernardino, Kern, Kings, and Inyo counties in California; Nye, Clark, Lincoln, White Pine, and Elko counties in Nevada; and Tooele County in Utah.

The ROI for the air quality and greenhouse gas (GHG) emissions includes Ventura County, which is in the South Central Coast Air Basin (SCCAB), and the western part of Los Angeles County, which is in the South Coast Air Basin (SCAB). For this analysis, the ROI would be expanded to also include the counties affected by the possible haul routes for demolition and environmental cleanup activities. Although many counties might be affected by the possible haul routes, potentially significant, moderate, or minor impacts would be expected only throughout Los Angeles County and the western portion of Kern County, which is in the San Joaquin Valley Air Basin (SJVAB).

## 3.5.1 Regional Settings

The following subsections discuss the regional meteorology relevant to defining the existing air quality conditions, attainment status, and emission inventories, which together define the existing conditions for the region surrounding SSFL. The regional meteorology depicts how pollutants released within the region might be dispersed by the predominant wind and temperature patterns. The regional attainment status identifies highly polluted areas in which air quality improvement is needed. The regional emission inventories, maintained by the California Air Resources Board (ARB), summarize the types and quantities of pollutants released within the region during the year.

### 3.5.1.1 Meteorology

Weather conditions for the SCCAB and SCAB, which are bordered by the Pacific Ocean and mountain ranges, include a persistent temperature inversion, which acts as a lid that prevents air pollutants from escaping upward. Depending on the season, the pollution produced during an individual day either is moved out (flushed) or retained within the SCCAB and SCAB. This variation is a result of the daytime sea breeze (onshore), which transports pollutants through the mountain passes, and of the nighttime land breeze (offshore), which transports pollutants back toward the Pacific Ocean. On most spring and early summer days, the sea breeze predominates; from late summer through the winter months, the two breezes are matched more equally (Ventura County Air Pollution Control District [VCAPCD], 2003; South Coast Air Quality Management District [SCAQMD], 1993).

Unlike the SCCAB and SCAB, the SJVAB is bounded by mountain ranges to the east, south, and west. As a result, the SJVAB's weather conditions include frequent temperature inversions; long, hot summers; and stagnant, foggy winters. Each of these patterns is conducive to the formation and retention of air pollutants year-round (SJVAPCD, 2002).

### 3.5.1.2 Attainment Status

The Clean Air Act (CAA) requires the U.S. Environmental Protection Agency (EPA) to set National Ambient Air Quality Standards (NAAQS) for pollutants considered harmful to public health and the environment. EPA has established NAAQS for the following six principal pollutants, which are called criteria pollutants: carbon monoxide (CO), lead, nitrogen dioxide ($NO_2$), ozone, particulate matter, and sulfur dioxide ($SO_2$). Appendix H summarizes the NAAQS for these criteria pollutants. Areas that meet the air quality standard for the criteria pollutants are designated as being "in attainment." Areas that do not meet the air quality standard for one of the criteria pollutants could be subject to the formal rule-making process, known as the General Conformity Rule, and are designated as being "in nonattainment" for that standard. Areas that currently meet the air quality standard but previously were classified as nonattainment are "in maintenance" for that standard; maintenance areas also are subject to the General Conformity Rule. Appendix H summarizes the federal attainment status for the counties that potentially would be affected by the Proposed Action and Appendix I provides the air quality general conformity analysis. (More detail about air quality is provided in Section 4.7).

Of the counties potentially affected by the Proposed Action, Ventura, Los Angeles, San Bernardino, Kern, Kings, Clark, White Pine, and Tooele counties are in nonattainment or maintenance for several pollutants. As a result, the Proposed Action is subject to review under the General Conformity Rule. The General Conformity Rule would be applied only to the pollutants that are in nonattainment or maintenance, as listed in Appendix H.

#### 3.5.1.3 Emissions Inventories

The most recent published emissions inventory data for Ventura, Los Angeles, and Kern counties are summarized in Appendix H. Each county's emissions are described in the following text.

In Ventura County, mobile source emissions account for more than 60, 80, and 90 percent of the county's CO, oxides of nitrogen (NOx), and oxides of sulfur (SOx) emissions, respectively. Area sources account for more than 80 percent of the county's particulate emissions. Natural (non-constructed) sources account for more than 40 percent of the county's volatile organic compound (VOC) emissions.

In Los Angeles County, mobile source emissions account for more than 90, 80, 60, and 40 percent of the county's CO, NOx, SOx, and VOC emissions, respectively. Area sources account for more than 70 percent of the county's particulate emissions.

In Kern County, mobile source emissions account for more than 60 and 70 percent of the county's CO and NOx emissions, respectively. Stationary sources account for more than 80 percent of the county's SOx emissions and 30 percent of the county's VOC emissions. Natural sources also account for 30 percent of the county's VOC emissions. Area sources account for more than 70 percent of the county's particulate emissions.

### 3.5.2 Local Settings

This subsection provides a discussion of the local meteorology, criteria pollutant emissions, and monitored air quality, which together define the existing conditions at SSFL. The local meteorology depicts how pollutants released within the SSFL boundary might be dispersed by the predominant wind and temperature patterns. The criteria pollutant emissions summarize the emissions currently released by SSFL operations. The monitored air quality, maintained by the ARB, summarizes the background concentrations of criteria pollutants at SSFL.

#### 3.5.2.1 Meteorology

Winds at SSFL closely follow the terrain, with most winds blowing from the southwest through the canyons to the northeast. Although SSFL is within Ventura County and abutting the Los Angeles County border, the area does not necessarily exhibit the same meteorological characteristics as these counties because of the steep terrain specific to SSFL. As a result, winds sometimes blow from the southeast and northwest. The variation in local terrain could substantially affect air dispersion by blocking anticipated wind patterns or channeling winds through canyons, thus increasing the likelihood that emissions would remain onsite.

#### 3.5.2.2 Criteria Pollutant Emissions

Air pollutant discharge limitations at SSFL are imposed by the VCAPCD's rules and regulations. NASA maintains a Permit to Operate with the VCAPCD, which is kept current and renewed each year. NASA operations do not emit lead, and other emissions of criteria air pollutants at SSFL currently are below the applicable permit limits. Depending on the remedial technology to be implemented under the Proposed Action, permits limiting the quantity of VOCs during operation might be warranted, as discussed in Section 4.7.

#### 3.5.2.3 Monitored Air Quality

The air monitoring stations closest to SSFL are those at 5400 Cochran Street in Simi Valley, 18330 Gault Street in Reseda, and 228 W. Palm Avenue in Burbank. Although other ambient air monitoring stations within Los Angeles and Ventura counties were considered, these three stations were selected because they are the closest stations that consistently monitor a majority of the criteria pollutants. Additionally, because of SSFL's proximity to the Pacific Ocean, the availability of monitored data west and southwest of the site is limited to one station and only two criteria pollutants. As a result, the data from the three ambient air monitoring stations selected are representative for this EIS.

The Simi Valley station, approximately 3 miles north of SSFL, monitors ozone, particulate matter having an aerodynamic equivalent diameter of 10 microns or less ($PM_{10}$), particulate matter having an aerodynamic equivalent diameter of 2.5 microns or less ($PM_{2.5}$), and $NO_2$. The Reseda station, approximately 9 miles southeast of SSFL, monitors ozone, $PM_{2.5}$, CO, and $NO_2$. The Burbank station, approximately 21 miles southeast of SSFL, monitors ozone, $PM_{10}$, $PM_{2.5}$, CO, $NO_2$, and $SO_2$. Appendix H provides a summary of the ambient criteria pollutant concentrations at air quality monitoring stations near SSFL. As noted in Appendix H, the results of ambient monitoring at the stations from the latest 3 years of available data indicate that both the monitored background ozone and $PM_{2.5}$ concentrations exceeded the NAAQS in 2010, 2011, and 2012 at one or more stations. Note that the monitored background concentrations are intended to represent the current conditions in the project vicinity without implementation of the Proposed Action.

### 3.5.3 Greenhouse Gases

GHG emissions also are regulated at the federal level. On October 30, 2009, EPA published a Final Rule that requires mandatory reporting of GHG emissions from facilities that have major stationary sources generating 25,000 metric tons[2] or more of carbon dioxide equivalent ($CO_2e$) emissions during operation (EPA, 2013a). The GHGs covered by the Final Rule are carbon dioxide ($CO_2$), methane ($CH_4$), nitrous oxide ($N_2O$), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride ($SF_6$), and other fluorinated gases including nitrogen trifluoride and hydrofluorinated ethers. Data published by EPA indicate that SSFL did not report GHG emissions to EPA in 2012 because onsite operational activities did not generate more than 25,000 metric tons of $CO_2e$ per year (EPA, 2013b).

On February 18, 2010, the Council on Environmental Quality (CEQ) provided draft guidance regarding the methods by which federal agencies can improve their consideration of the effects of GHG emissions and climate changes in their evaluations of Proposed Actions. The guidance states that estimates of the expected annual direct and indirect GHG emissions should be quantified and disclosed, particularly for "meaningful" emissions which, for direct GHG emissions, are described as 25,000 metric tons $CO_2e$ annually (CEQ, 2010). Although current SSFL activities do not generate more than 25,000 metric tons of $CO_2e$, the Proposed Action would be evaluated against this threshold.

## 3.6 Water Resources

This subsection provides a discussion of the existing water resources including surface water hydrology and quality, groundwater hydrology and quality, and flood potential at SSFL. The ROI for surface water resources includes SSFL and connected watersheds, specifically the Los Angeles River and Calleguas Creek watersheds. The ROI for groundwater resources is the area included in the mountain groundwater system that encompasses SSFL. Sections 3.6 and 3.7 provide related discussions of water pollution control and erosion and sedimentation, respectively. Section 3.2 includes a discussion of potable water supply.

### 3.6.1 Surface Water

Within the NASA-administered portion of SSFL, the primary surface water bodies are the R-2 ponds, which are permanent surface water bodies actively used as part of the SSFL-wide reclaimed water system. Other surface water bodies within the ROI are limited to ponds that formerly supported rocket engine testing operations. These ponds are no longer a part of NASA operations, but collect natural and artificial flows generated from throughout the ROI.

Most surface water that collects and drains in the ROI is intermittent and is conveyed offsite via one of two drainages, the Northern Drainage and the Southwestern Drainage (MWH, 2009b). Figure 3.6-1 shows the drainage patterns related to the Northern Drainage and the Southwestern Drainage. The majority of the surface water from the NASA-administered portion of SSFL originates in the larger Southwestern Drainage, which is part of the

[2] Per 40 *Code of Federal Regulations* 98, GHGs are measured in metric tons so that reported data are consistent with international protocols for GHG emissions reporting, which use the metric format (EPA, 2009).

Los Angeles River watershed. The Northern Drainage is part of the Calleguas Creek Watershed, with unnamed surface water features that discharge into Arroyo Simi (within the incorporated Simi Valley city limits). A small portion of the ROI is within the Northwestern Drainage (Calleguas Creek Watershed). The NASA-administered portion of SSFL includes two primary regulated outfalls–Outfall 018 (Southwestern Drainage) and Outfall 009 (Northern Drainage)–as well as several smaller regulated outfalls (Regional Water Quality Control Board [RWQCB], 2009). Figure 3.6-1 shows the locations of Outfalls 018 and 009.

Beneficial uses of water (water that meets State water quality standards) are not being met in the Los Angeles River, Calleguas Creek, and their tributaries in the Southwestern and Northern Drainages, respectively. Because the water in these features is not meeting State water quality standards, they are listed as impaired pursuant to the federal CWA (Section 303[d]). The headwaters of the creek in the Southwestern Drainage are included specifically on the 303(d) List, with coliform bacteria as the listed pollutant. Waters downstream of the creek in the Southwestern Drainage are listed for coliform bacteria, volatiles (1,1-dichloroethene, vinyl chloride, tetrachloroethene, and trichloroethene [TCE]), trash, and oil (California Regional Water Quality Control Board [CRWQCB], 2009). The stressors listed in the 2006 303(d) List for Calleguas Creek are boron, chloride, sulfates, fecal coliform, trash, and total dissolved solids (CRWQCB, 2009). In response to the 303(d) listings, total maximum daily loads (TMDLs) have been developed for a number of the stressors listed for both the Los Angeles River and Calleguas Creek watersheds. Achievement of the TMDLs is expected to contribute to removing the water quality impairments. Table 3.6-1 lists these TMDLs.

Stormwater traversing SSFL has contained elevated concentrations of a number of contaminants as a result of historical operations. Because stormwater is also an active vehicle for transporting contamination in sediments, it is a focus of remedial action. SSFL currently has 16 active outfalls. Outfalls 009, 012, 013, and 018 are located on the NASA-administered portion of SSFL (Figure 3.6-1). Discharges from Outfalls 012, 013, and 018 enter the creek in the Southwestern Drainage, a tributary to the Los Angeles River. The receiving water for the stormwater runoff from Outfall 009 is the Arroyo Simi, a tributary of Calleguas Creek.

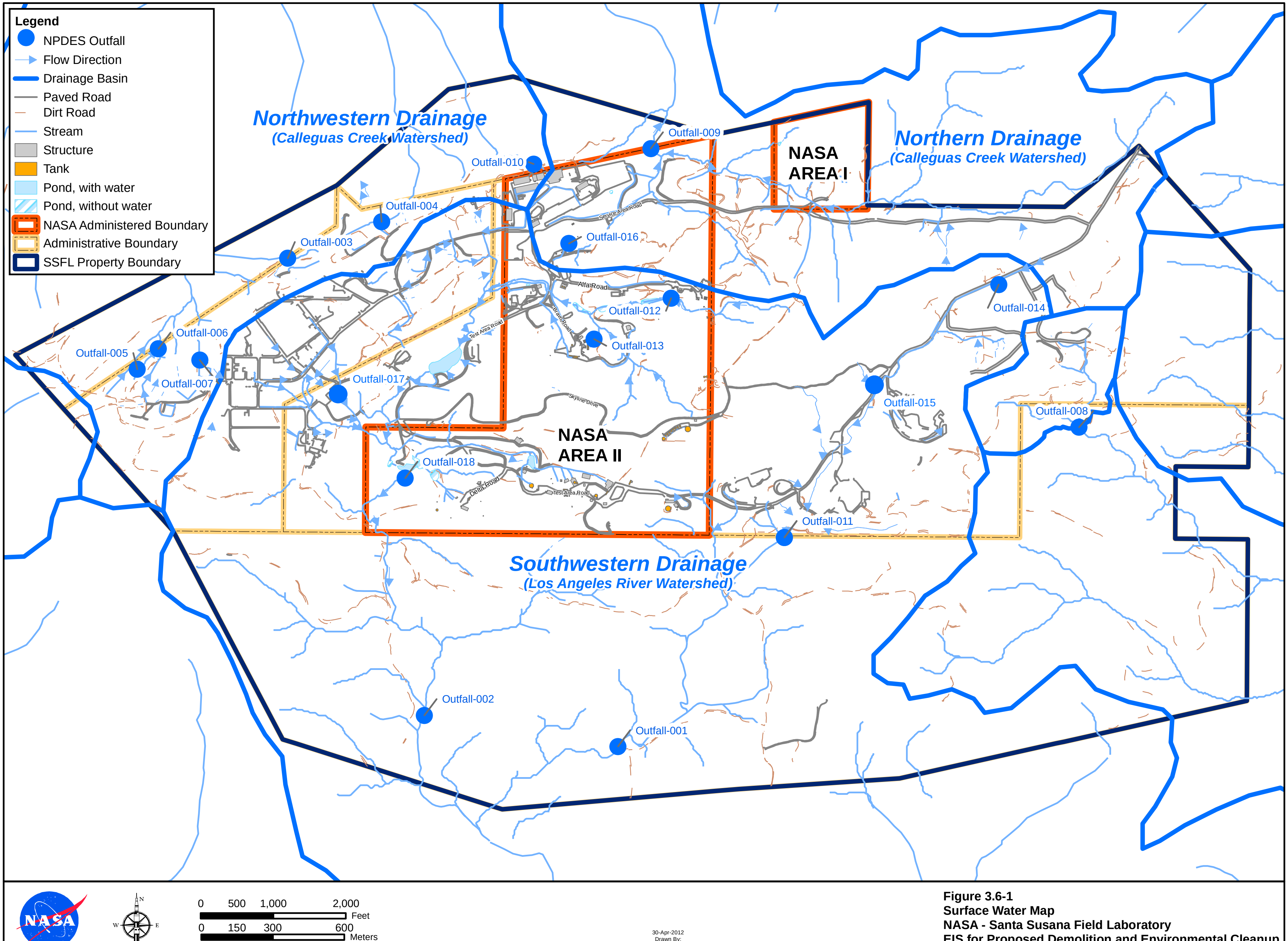
The discharge of stormwater runoff at the outfalls is subject to the National Pollutant Discharge Elimination System (NPDES) permit effluent limitations, discharge specifications, and benchmarks. Constituent concentrations are monitored and measured in accordance with the NPDES Permit Monitoring and Reporting Program.

Discharges from the site are regulated under NPDES Permit No. CA0001309, issued to Boeing by the Los Angeles RWQCB. Monitoring data collected from the fourth quarter 2006 through first quarter 2009 indicated violations of the NPDES permit for2,3,7,8-tetrachloro-dibenzo-p-dioxin–toxicity equivalent (TCDD-TEQ), total suspended solids, iron, and manganese at Outfall 018 and of TCDD-TEQ at Outfall 009. Between second quarter 2009 and second quarter 2012, exceedances of lead and TCDD-TEQ were measured at Outfall 009.

## 3.6.2 Groundwater

The boundaries of the mountain groundwater system encompassing SSFL (the groundwater ROI) are considered to include the water table under SSFL and the surrounding area, groundwater discharge locations focused at hillside seeps and stands of phreatophytes in surrounding canyons, and lateral outflow boundaries present at depth where the Simi Hills meet the floor of the Simi and San Fernando valleys. The potential for subsurface groundwater outflow (lateral outflow boundaries) exists along the entire mountain perimeter except due west of SSFL, where the boundary is approximately parallel to the inferred directions of groundwater flow. These lateral boundaries encompass an area of 20 square miles; SSFL occupies approximately 22 percent of that area (MWH, 2009c).

Historical and ongoing groundwater production from SSFL wells demonstrates that portions of the Chatsworth Formation make up locally productive aquifer units. These units generally consist of fractured sandstone members of the upper Chatsworth Formation, many of which are up to several hundred feet thick. Separating the major sandstone units are a series of relatively thin shale and siltstone members, some of which behave as aquitards (MWH, 2009c). Movement of groundwater through soil can be retarded or terminated by aquitards (MWH, 2009c).




30-Apr-2012
Drawn By:
A. Cooley

**Figure 3.6-1**
**Surface Water Map**
**NASA - Santa Susana Field Laboratory**
**EIS for Proposed Demolition and Environmental Cleanup**

Map Document: O:\NASA\SSFL\maps\EIS_2011\EIS_SurfaceWaterVicinity.mxd

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TABLE 3.6-1
**Total Maximum Daily Loads for Los Angeles River and Calleguas Creek Watersheds**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Stressor | Los Angeles River Watershed | Calleguas Creek Watershed |
|---|---|---|
| Coliform Bacteria | 126/100 mL–mean target<br>235/100 mL–single sample target | 200/100 mL–30-day period<br>400/100 mL–10 percent of total samples during any 30-day period |
| 1,1-DCE | 6 µg/L daily maximum<br>3.20 µg/L monthly average | N/A |
| TCE | 5.0 daily max | N/A |
| Trash | 0 | 0 |
| Oil | 15-mg/L daily maximum<br>10-mg/L monthly average | N/A |
| Boron | N/A | 1 mg/L |
| Chloride | N/A | 150 mL/L |
| Sulfates | N/A | 250 mL/L |
| Total Dissolved Solids | N/A | 850 mg/L |

Notes:
µg/L = micrograms per liter
DCE = dichloroethene
mL = milliliters
mL/L = milliliters per liter
mg/L = milligrams per liter
N/A = not applicable. There is no water quality impairment for this constituent.

Sources: CRWQCB (2009); LARWCQB (2005a; 2005b; 2007; 2008a; 2008b; 2010; 2011)

Faults influence the hydrogeologic structure in several ways including off-setting or truncating permeable zones and fractures, juxtaposing of different units and fold orientations, creating low-permeability boundaries formed along fault planes, and likely creating discontinuous zones of enhanced permeability from fracturing along the fault core and within adjacent damage zones. Major faults subdivide SSFL into roughly 10 large blocks, which are further subdivided by shale beds. In addition, the Chatsworth Formation contains a systematic network of bedding-parallel and bedding-perpendicular fractures that result in a hydraulic continuum of groundwater flow throughout the system (MWH, 2009c).

Environmental sampling to characterize site conditions at SSFL is ongoing. NASA has conducted such sampling on its portion of SSFL for more than 20 years. The results of this sampling effort indicate that primarily metals, dioxins, PCBs, volatile organics including TCE, and semivolatile organics are present in the soils and upper groundwater, known as the Surficial Media Operable Unit (SMOU). Volatile organics, metals, and semivolatile organics also are present in the deeper groundwater, known as the Chatsworth Formation Operable Unit (CFOU) (MWH, 2009c). Contamination and the results of these studies are discussed further in Section 3.8.

# 3.7 Soils, Landslide Potential, Topography, and Paleontological Resources

This section describes the soils, landslide potential, topography, and paleontological resources at SSFL. The ROI for soils, landslide potential, topography, and paleontological resources is the NASA-administered areas of SSFL. Although other geologic units lie near the ROI (MWH, 2007c; 2009b), they would not be affected by the Proposed Action and are not considered further.

## 3.7.1 Soil Conditions

Soils are generally thin in the ROI, typically ranging from 5- to 15-ft thick. These soils usually occur in topographic lows and along stream drainages, although a thin (5- to 10-ft-thick) alluvial veneer covers the Burro Flats area. Disturbed soils also have been used as fill materials in developed portions of the ROI. Native and fill soils generally are composed of the weathered Chatsworth Formation materials and are typically fine-grained silty sands (MWH, 2007; MWH, 2009). No saturated soils are present in the ROI.

Erosion is defined as the combination of processes by which the materials at the earth's surface are loosened, dissolved, or worn away and transported by natural agents. Erosion potential of soils primarily is influenced by soils' cohesion and slope, with compact soils and flat ground providing the least erosion potential, and loose soils and large slopes providing the greatest potential. Erosion has resulted in significant negative impacts within and outside of SSFL in the past (CRWQCB, 2010).

## 3.7.2 Topography

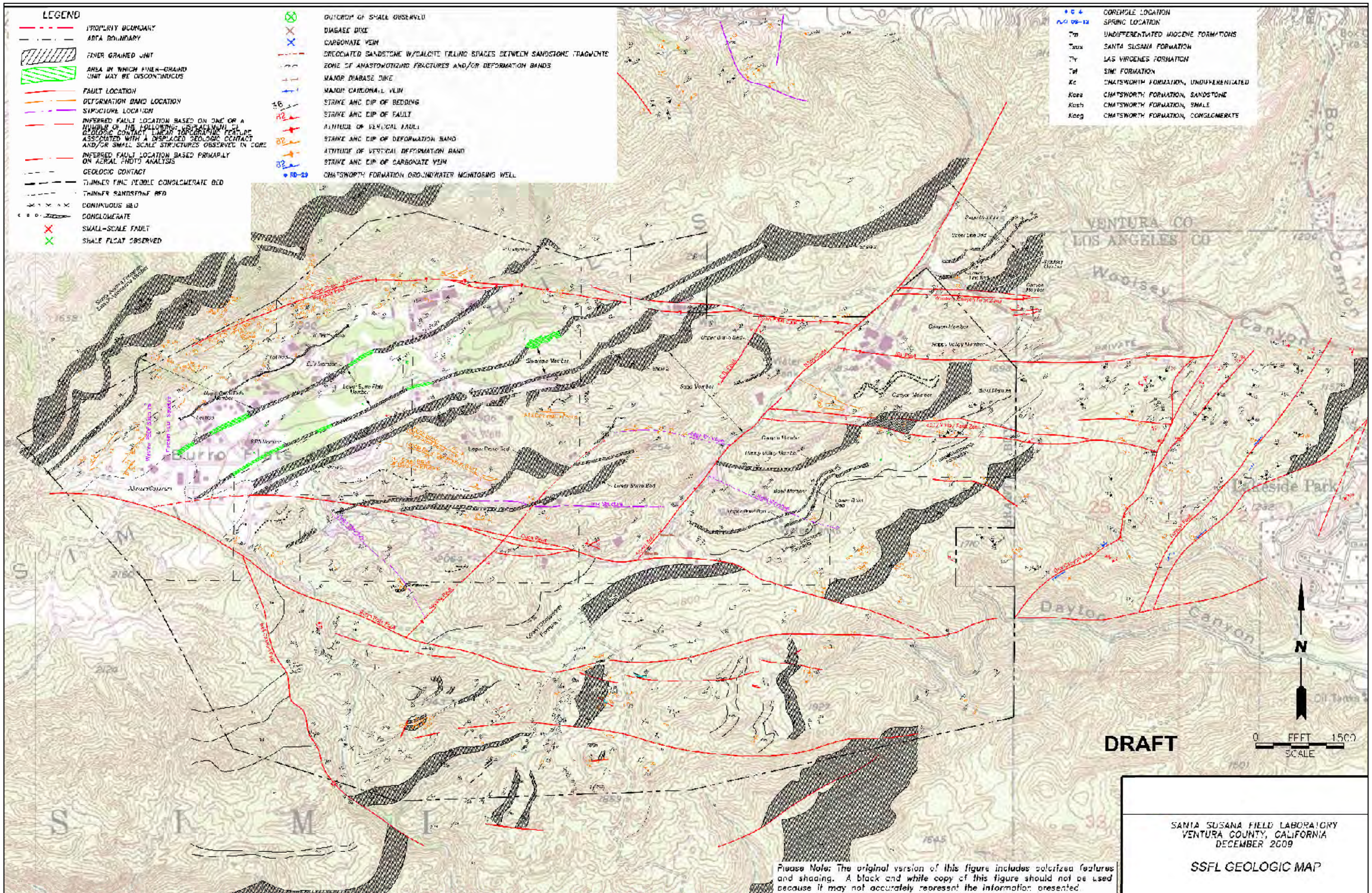
SSFL occupies approximately 2,850 acres of hilly terrain that expresses approximately 1,100 ft of topographic relief near the crest of the Simi Hills. The highest surface elevation in the ROI occurs in the southern portion of the ROI at an approximate elevation of 2,665 ft above mean sea level (msl). The highest surface elevation in the ROI occurs in a series of peaks that trend east-west. The lowest elevation in the ROI occurs near the northern property boundary of the NASA-administered property, along the eastern boundary of the broad, flat Burro Flats area. Elevations in this area are approximately 1,700 ft above msl. The southern portion of the ROI is rugged, while the northern portion of the ROI is dominated by a broad, relatively flat region.

## 3.7.3 Geology

SSFL lies within the Transverse Ranges, an area dominated by mountain ranges and valleys running east-west. Marine sedimentary rocks dominate the ROI (MWH, 2009a). These sedimentary rocks have been uplifted and rotated by extensive faults in the region over the past several million years, and these processes continue today (Nicholson et al., 1994). This bedrock has been broken down over time, resulting in a layer of broken rock known as weathered bedrock, and in places a thin layer of soils. The geologic units underlying the ROI would determine the potential for an activity to affect or be affected by the geology of the NASA-administered property. The geologic unit underlying the ROI is the Cretaceous Chatsworth Formation, a marine sedimentary unit composed of sandstones, shales, and conglomerates (sedimentary units composed of rounded pebbles and cobbles) (Colburn et al., 1981). The only exception is the access road into and out of the ROI, which is underlain by Miocene (23 to 5.30 million years ago) sediments of the Topanga and Modelo formations (Kew, 1924; State of California, 1998). The geological features of SSFL are shown in Figure 3.7-1.

## 3.7.4 Landslide Potential

Landslides, or sudden slope failures, are known historical hazards in the region (State of California, 1998). Landslides can be triggered by a number of causes, such as earthquakes, heavy rain, or increased loads (for example, increased traffic). No landslides are known to have occurred within the ROI since development began, and the Chatsworth Formation is not known to be highly susceptible to landslides (Parise and Jibson, 2000). Several of the geologic units, particularly those underlying the access roads into and out of the ROI (the Miocene [23 to 5.30 million years ago] Topanga and Modelo formations) are susceptible to landslides (Parise and Jibson, 2000).




25-Feb-2014

**Figure 3.7-1**
**Site Geology**
**NASA - Santa Susana Field Laboratory**
**EIS for Proposed Demolition and Environmental Cleanup**

Map Document: O:\NASA\SSFL\maps\EIS_2011\EIS_Geology_MWHfig.mxd

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Periodic but relatively minor earthquakes have caused past landslides in Ventura County. Although Ventura County is tectonically active, no large earthquake (magnitude greater than 6.0) has occurred in the region (Weber and Kiessling, 1978). Impacts from the historical tectonic activities near the ROI have resulted primarily in bedding parallel and bedding perpendicular fractures with numerous fault blocks and fault zones that traverse the property (Parise and Jibson, 2000).

### 3.7.5 Paleontology

Paleontological resources are fossils–the remains of ancient plants and animals–and are considered non-renewable scientific resources. A review of available geologic maps, scientific publications, technical reports, and other references was conducted to identify geologic formations that would be likely to contain paleontological resources and to identify paleontological resources that previously had been identified by others near the ROI. Appendix J discusses the results of this review, which represent the current site conditions.

The Chatsworth Formation only rarely produces fossils, although the fossils that are found are scientifically important. The nearest identified fossils were 1.5 miles east of the ROI (Squires et al., 1981).

## 3.8 Hazardous and Nonhazardous Materials and Waste

This subsection provides a discussion of storage and handling, waste management, and existing hazardous materials in air, ground or surface waters, and soils within the NASA administered properties at SSFL and surrounding areas. Sections 3.5, 3.6, and 3.9 provide related discussions of air quality, water quality, and health and safety, respectively. The ROI selected for this evaluation includes the NASA-administered property of SSFL (Area I [LOX Plant] and Area II) and roadways accessing the NASA property, primarily Black Canyon and Woolsey Canyon Road.

### 3.8.1 Waste Management

Wastes generated or stored at SSFL are managed according to the applicable regulations provided in Appendix B. Wastes are stored within a secured less–than-90-day storage area at the SPA area until characterized. Upon receiving laboratory analytical results, the waste is transported offsite and disposed in accordance with hazardous waste management requirements.

### 3.8.2 Contaminated Areas

Section 1.1 provides a discussion of potential activities conducted at SSFL that resulted in a release of contamination within and adjacent to the NASA-administered property at SSFL and an overview of the RIs conducted to characterize the site. Structural materials that might contain hazardous substances also are discussed.

#### 3.8.2.1 Radioactive Waste

The DOE leases 90 acres of Area IV owned by Boeing. Past operations conducted by the DOE in Area IV included development and operation of reactors. Past operations of Boeing and its predecessors at SSFL also included research, development, assembly, disassembly, and testing of nuclear reactors (CRWQCB, 2009); all of which were terminated in 1989. Nuclear materials were not used, stored, or disposed on the NASA-administered properties of SSFL. EPA evaluated the presence and nature of potential radiological contamination at SSFL. NASA screens excavated soils and debris from structures to confirm that the excavated materials have no radiologic restrictions or local, state, and federal requirements regarding management, handling, or disposal.

#### 3.8.2.2 Structures

Section 2.2 (Table 2.2-1) lists the structures proposed for demolition on the NASA-administered property at SSFL. In addition to these structures, other infrastructure includes the following:

- Aboveground and subsurface structures
- Building foundations
- Utility poles
- Piping

- Administration and operations buildings
- Water tanks
- Aboveground and belowground storage tanks
- Observation lookouts, roadways, and drainageways

Table 3.8-1 lists typical sources of hazardous materials in buildings such as those found at SSFL, along with examples of common hazardous materials that could be present in these buildings and structural components.

TABLE 3.8-1
**Potential Hazardous Materials Encountered in Buildings and Structures**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Potential Hazardous Material | Building Component |
|---|---|
| Lead-based Paint | Building surfaces, steel, window surfaces, chalking |
| Asbestos-containing Material | Floor tiles, caulking, siding, insulation, ceiling materials |
| Mercury | Fluorescent light tubes, thermostats, lighted exit signs or emergency lights, electric control panels |
| Polychlorinated Biphenyl (PCB) | Fluorescent light ballasts, transformers, generators, circuit breakers, caulking, paint |
| Trichlorobenzene | Fluorescent light ballasts, transformers |
| Diethylhexyl Phthalate | Fluorescent light ballasts, transformers |
| Cadmium | Lighted exit signs or emergency lights, batteries, battery chargers |
| Lead | Lighted exit signs or emergency lights, batteries, battery chargers |
| Ozone-Depleting Chemical | Smoke detectors, fire extinguishers, drinking water fountains, air-conditioner and chiller units |
| Americium | Smoke detectors |
| Lithium | Batteries in emergency lighting |
| Tritium | Exit signs |
| Ethylene glycol | Air-conditioner and chiller units |
| Radium | Electric control panels |
| Radiological materials | Building surfaces, equipment, and/or debris (metal, concrete, asphalt, or other) |
| Notes: Source: NASA, 2011a | |

### 3.8.2.3 Sampling of Contaminated Areas

NASA conducted environmental sampling to characterize site conditions on the NASA-administered property. Soil and groundwater contamination was documented in five RI reports (NASA, 2008b, 2009a, 2009b; MWH, 2009c, 2007b). More recent investigations under NASA's soil Field Sampling Plans have further characterized the vertical and lateral extent of the contaminants based on screening levels provided by DTSC (NASA, 2011c). NASA's investigations before 2010 were focused on identifying contaminants that posed unacceptable risks to human and ecological receptors, and did not evaluate the nature and extent of chemicals present at concentrations with respect to background levels. The results indicate that metals, dioxins, PCBs, VOCs, and semivolatile organic compounds (SVOCs) are present in the soils (Section 3.9.5 provides more details). For deeper groundwater, VOCs, metals, and SVOCs also are present (Section 3.6.2 provides more details). For example, engine testing at SSFL primarily used petroleum-based compounds (high grade kerosene, such as Rocket Propellant 1 and Jet Propellant 4) as the "fuel" and LOX as the "oxidizer." Solvents like as TCE were used for cleaning parts and equipment such as rocket engine components. The solvent runoff was allowed to percolate into the soil and groundwater. Solid propellant testing using monomethylhydrazine + nitrogen teroxide was not conducted at the large rocket engine test stands, but was used in small rocket motor testing and various research and development programs. Rocket engine and component testing generated fuel-related contaminants and heavy metals.

For investigation and reporting purposes, the contaminated sites at SSFL are considered by geographic locale and similar historical use (referred to as RI groups) rather than by ownership. An RI group could have contaminated sites that may have been owned and/or operated by NASA, Boeing, or DOE. The NASA-administered property is composed of portions of RI Group 2, RI Group 3, RI Group 9, and all of RI Group 4 (Figure 3.8-1). The subsections below provide discussions of these groups; Table 3.8-2 lists the contaminants known to be present in these groups. In addition, radionuclides have been detected in the soil generated from ISRA activities. The soils were shipped containing concentrations uranium-238, cesium-137, and strontium-90 slightly above the radiological Look-Up Table values. Additional sampling (as specified in site-specific field sampling plans) to refine the extent of contamination based on current background levels recently has been conducted. The sample locations specified in the field sampling plans were step-out samples, placed at locations to evaluate the lateral and vertical extents of a contaminant concentration that was above the background level. The sample locations also provided characterization of areas that previously had not been sampled, but that had been identified as areas potentially containing contaminants. Samples were collected in the alluvium from ground surface until refusal was encountered. Also, a groundwater treatability study (as discussed in the Groundwater Interim Measures Work Plan [MWH, 2007a], which was submitted to DTSC) is being evaluated and implemented.

**Group 2**

NASA has conducted extensive sampling of the soil, soil vapor, and groundwater at the five Group 2 sites. The chemicals at the sites are known and the extents of these chemicals have been evaluated to varying degrees. After an evaluation of the data and an assessment of the risk to humans and ecological receptors, the findings indicate that elevated risks occur only in localized areas in Group 2 (NASA, 2008b). Additional information regarding the 2008 Group 2 investigation report and its associated risk assessment is located at http://ssfl.msfc.nasa.gov/environmental-cleanup/environmental-impact-statement/default.aspx.

**Group 3**

NASA has conducted extensive sampling of the soil, soil gas, and groundwater at the five Group 3 sites and the Skyline Drive Area. The chemicals at the sites are known and, for the most part, the extent of these chemicals has been evaluated to varying degrees. After an evaluation of the data and an assessment of the risk to humans and ecological receptors, the findings indicate that elevated risks occur only in localized areas in Group 3 (NASA, 2009a). Additional information regarding the 2009 Group 3 investigation report and its associated risk assessment is located at http://ssfl.msfc.nasa.gov/environmental-cleanup/environmental-impact-statement/default.aspx.

**Group 4**

After an evaluation of sampling data and an assessment of the risk to humans and ecological receptors, the findings indicate that elevated risks occur only in localized areas in Group 4 (MWH, 2007b). Additional information regarding the 2007 Group 4 investigation report and its risk assessment is located at http://ssfl.msfc.nasa.gov/environmental-cleanup/environmental-impact-statement/default.aspx.

**Group 9**

Sampling of the soil, sediment, surface water, soil gas, and groundwater at the Group 9 sites has been conducted, along with an assessment of the risks posed to both human and ecological receptors. The chemicals at the sites are known and, for the most part, the extent of these chemicals has been evaluated. The findings indicate that elevated risks to humans and ecological receptors occur only in localized areas in Group 9 (NASA, 2009b). Additional information regarding the 2009 Group 9 investigation report and its associated risk assessment is located at http://ssfl.msfc.nasa.gov/environmental-cleanup/environmental-impact-statement/default.aspx.

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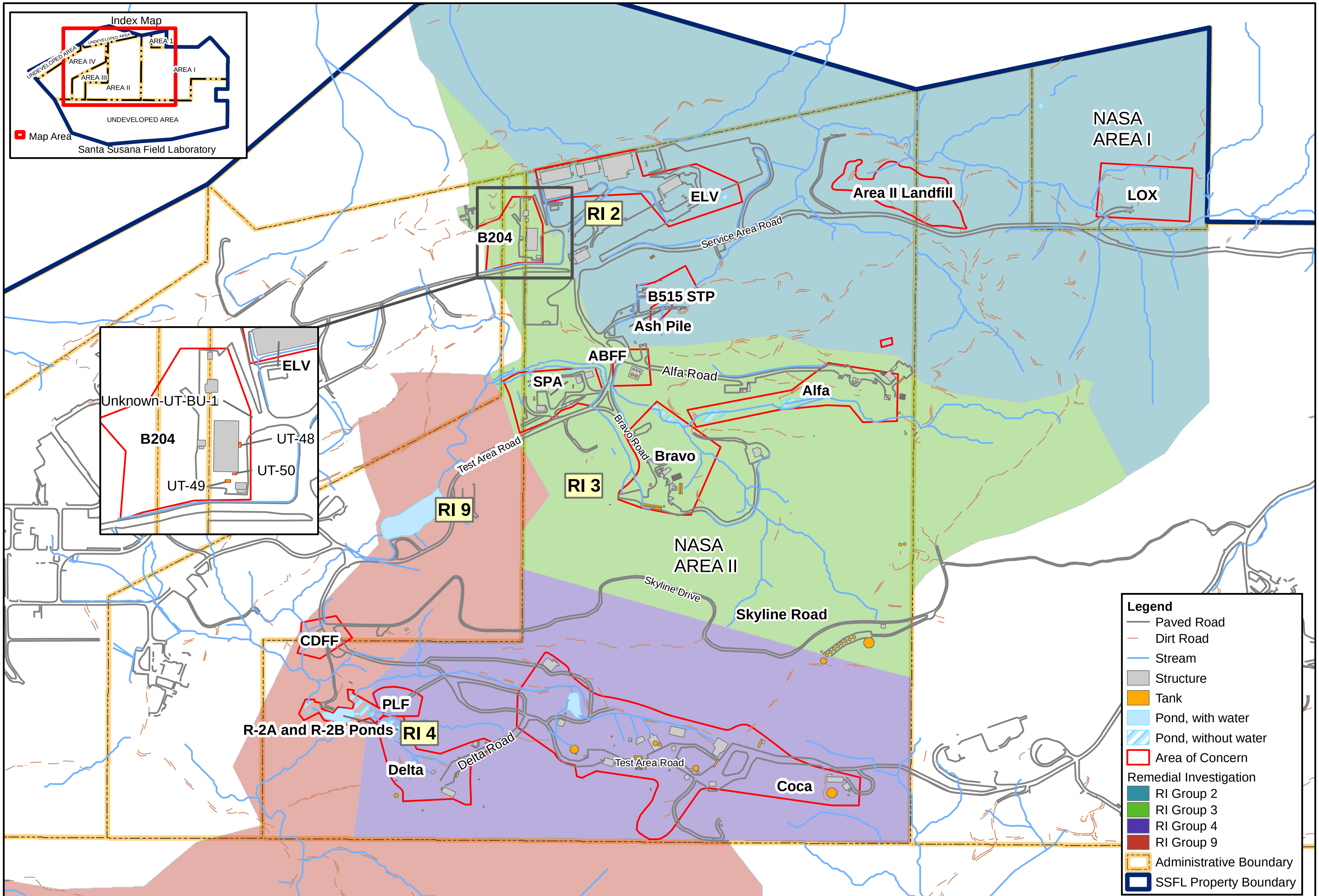


0 500 1,000 2,000 Feet
0 150 300 600 Meters

10-May-2012
Drawn By:
A. Cooley

**Figure 3.8-1**
**Remedial Investigation Groups within NASA-Administered Property of SSFL**
**NASA - Santa Susana Field Laboratory**
**EIS for Proposed Demolition and Environmental Cleanup**

Map Document: O:\NASA\SSFL\maps\EIS_2011\EIS_RFIGroups_SDE.mxd

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TABLE 3.8-2
**Contaminants Present on NASA-administered Property**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Site Name | Contaminants of Concern |
|---|---|
| **Group 2** | |
| LOX Plant | Dioxins, metals, PAHs, VOCs, SVOCs, TPHs |
| Area II Landfill | Dioxins, metals (including mercury), coplanar PCBs, PAHs, VOCs, SVOCs, TPHs |
| ELV | Dioxins/furans (including coplanar PCBs), mercury, PAHs, VOCs, SVOCs, TPHs |
| Ash Pile and Sewage Treatment Plant | Dioxins/furans, metals, PAHs, PCE, TCE, diesel range organics |
| SMOU | None listed, but transfer from the soil is likely |
| **Group 3** | |
| Building 204 USTs | Dioxins/furans, metals, PAHs, VOCs, SVOCs, diesel range organics |
| SPA | Formaldehyde, silver, PAHs, SVOCs, methylene chloride, TCE, diesel range organics |
| Alfa/Bravo Fuel Farm | Lead, silver, cadmium, PAHs, SVOCs, TPHs |
| Bravo Area | Dioxins, metals, PCBs (including Aroclor-1254 and Aroclor-1260), carbon tetrachloride, PCE, 1,1-dichloroethane, TCE, TPHs |
| Alfa Area | Dioxins, metals, (lead, nickel, silver, zinc, chromium), PCBs, TCE, diesel range organics |
| Skyline Drive | Dioxins, silver, lead, manganese, PCBs (including Aroclor-1254), indeno(1,2,3-cd)pyrene, PAHs, and diesel range organics |
| Hazardous Waste Cooling Tower[a] | |
| SMOU | NSGW, VOCs, TPH |
| CFOU | NSGW, VOCs, TPH |
| **Group 4** | |
| Coca Area | VOCs, PAHs, TPHs, PCBs, dioxins, metals |
| Delta Area | Methylene chloride, 2-Butanone, formaldehyde, PAHs, Indeno(1,2,3-cd)pyrene, di-n-butyl phthalate, bis(2-ethylhexyl)phthalate, dioxins, zinc, lead, mercury, fluoride, diesel range organics |
| Propellant Loading Facility | VOCs, PAHs, SVOCs, diesel range organics, Aroclor-1260, dioxins, metals (zinc, chromium VI, copper, antimony) |
| **Group 9** | |
| Coca/Delta Fuel Farm | Dioxins, PCBs (including Aroclor-1254 and Aroclor-1260), zinc, silver, mercury, PAHs, TCE, indeno(1,2,3-cd)pyrene, diesel range organics |
| R-2 Ponds Area | Dioxins, PCBs (including Aroclor-1254, Aroclor-1260), zinc, mercury, silver, formaldehyde, PAHs, indeno(1,2,3-cd)pyrene, diesel range organics |
| SMOU | NSGW, TCE, cis-1,2-DCE, vinyl chloride, various metals |
| CFOU | NSGW, TCE, cis-1,2-DCE, copper, iron, manganese |
| Seeps/Springs | TCE, cis-1,2-DCE, trans-1,2-DCE, magnesium, sodium |

Notes:
NSGW = near surface groundwater
PAH = polycyclic aromatic hydrocarbon
PCE = tetrachloroethene
SPA = Storable Propellant Area
TPH = total petroleum hydrocarbon

[a] Site is owned by Boeing

# 3.9 Health and Safety

For this analysis, health and safety includes a consideration of onsite safety hazards to work crews and truck drivers associated with the Proposed Action, and to future visitors and offsite neighbors for the No Action alternative. Sections 3.9.5 and 3.9.6 describe the onsite and offsite health hazards, respectively. The project area will be controlled through access and no visitors would be allowed during the working phases. This evaluation includes natural environmental hazards, risks of material exposures, operational safety hazards, and structural hazards. This subsection provides a discussion of the health and safety risks and conditions for the NASA-administered property at SSFL and the offsite health risks based on comments received related to the DEIS. The ROI selected for this evaluation includes the NASA-administered property of SSFL (Area I [LOX Plant] and Area II) and roadways accessing the NASA property, including Facility Road, Skyline Drive, Black Canyon, and Woolsey Canyon Road. Section 3.10 provides an analysis of traffic safety.

Potential safety hazards could occur within the NASA-administered property at SSFL, including natural hazards, material exposure hazards, operational safety hazards, and structural hazards. Emergency response likely would be provided by local law enforcement, emergency response agencies, or fire departments. Natural hazards generally occur throughout SSFL and include weather, geography, and biology. Material, operational, and physical hazards typically are confined to buildings and developed areas onsite. The developed regions of SSFL include buildings used for various purposes including laboratories, process and assembly areas, disassembly areas, small and large engine test facilities and test stands, ASTs and USTs, clarifiers, sumps, trenches, maintenance facilities, treatment facilities, equipment yards, salvage areas, container and drum storage areas, flow-through ponds, retention ponds, impoundments, pits, landfills, burn pits, leach fields, storage pads, and storage and staging areas for both hazardous and nonhazardous products, wastes, and debris. The following subsections briefly discuss these hazards.

## 3.9.1 Natural Hazards

SSFL activities follow a worker Health and Safety Plan that is prepared or updated prior to each activity and customized to that activity. The Health and Safety Plan covers day-to-day operations to provide workers with a plan, list, or knowledge of potential conditions and natural hazards to cover worker safety.

Natural hazards include those posed by the site’s weather, geography, and biology. The average summer temperature of the region is 70 degrees Fahrenheit (°F) (Miles and Goudey, 1998); however, temperatures can reach much higher during the day, presenting a major risk of heat stress and related health and safety concerns. Winter temperatures are milder, averaging 40°F (Miles and Goudey, 1998). Daytime temperatures in the winter are higher, but in the evenings and mornings, temperatures can be much lower and present a risk of cold stress. Sunburn is also a sitewide hazard throughout the year. Low humidity can contribute to dehydration.

Geographically, the NASA-administered property at SSFL is rugged, with as much as 1,100 ft of topographic relief. Cliffs could present hazards for equipment and vehicles that travel off-road (for example, drill rigs traveling off-road for well installation). Rock falls and other hazards associated with unstable and steep slopes also could occur near the cliffs. A large number of trucks would be entering and exiting the site via Woolsey Canyon Road. This road is steep and winding, and although guardrails are present, there is the potential for a truck to run off the narrow road.

Botanical hazards include poisonous plants common in developed and undeveloped areas, such as poison oak. A less familiar botanical hazard is the yucca plant (*Hesperoyucca whipplei*), which has sharp leaves with tips rich in oxaloacetate, that can puncture even thick clothing (NASA, 2011a). The local plants also create the risk of wildfire. The groundcover of the NASA-administered property at SSFL includes low grasses and shrubs. The climate includes relatively dry summers (NASA, 2011a), which creates a substantial risk for wildfires.

Hazardous wildlife common to the region include stinging insects such as scorpions, ticks, spiders, and mosquitoes (NASA, 2011b). Bees are common at SSFL and might be present in abandoned or little-used buildings. Rattlesnakes also are common at SSFL and might be present in abandoned or little-used buildings, or in or under pipes or other debris onsite. In addition, large predators including feral dogs, coyotes, and mountain lions potentially could be found onsite (NASA, 2011b) and could use abandoned or unsecured buildings as resting places.

### 3.9.2 Material Exposure Hazards

Material hazards are those associated with the presence of hazardous materials within the NASA-administered property at SSFL. As described in Section 2.2, NASA would investigate potentially hazardous materials in each building to be demolished before demolition begins. Section 3.8 provides a further analysis of hazardous materials and waste. A number of health hazards, such as lead and asbestos, are known to be or are likely to be present in the buildings to be demolished.

Contamination from hazardous materials used or stored in the buildings might still be present, as well. Numerous fuels, oils, solvents, and other hazardous and/or flammable materials have been used and might still be stored in buildings in the NASA-administered property at SSFL. Buildings such as materials preparation shelters (Building 2932), storage sheds (Buildings 2775A through 2775E), and maintenance supply sheds (Building 2760) are particularly likely to house such materials. Other buildings in the NASA-administered property at SSFL (such as Building 2203, the Lasers Lab Facility) were used for testing lasers, rocket components, and other equipment and might pose unique materials hazards because of the materials required for the testing, such as fuel, oxidizers, and additives.

### 3.9.3 Operational Safety Hazards

Operational safety hazards potentially exist both in buildings that are being used and in abandoned buildings. Natural gas lines are located throughout the NASA-administered property at SSFL. Underground and overhead utilities are located near buildings, and in certain areas, extend into undeveloped portions of the site. High-pressure containers and utility lines also pose operational safety hazards. In addition, the roads at SSFL are narrow and have blind curves. Many trucks would be operating on these roads throughout the NASA-administered portions of SSFL, thus creating a potential driving hazard.

### 3.9.4 Physical Structural Hazards

Physical hazards include those typical at industrial facilities, such as slip, trip, and fall hazards. Many of the buildings also contain low utility lines and uneven walkways, which present overhead and underfoot hazards. There are many aboveground pipelines at SSFL that present tripping hazards. In addition to these common hazards, a number of buildings and structures at SSFL are abandoned. Such buildings pose numerous health and safety concerns, including (but not limited to) the presence of molds and the release of hazardous materials within the building; and the loss of structural integrity associated with being exposed to weather. Several structures have been listed as unsafe for workers to walk on or under because of such hazards.

### 3.9.5 Onsite Health Hazards

This section has been included in order to evaluate the risks and potential impacts from the No-Action alternative and to address public comments. Below is a summary of the risks assessments that have been performed to date. The potential No-Action impacts are discussed within each resource media of Section 4 (i.e., Biological, Health and Safety).

NASA has sampled the soil and groundwater at SSFL and performed risk assessments that describe the health risks associated with different types of exposures (residential, industrial, recreational, and ecological) within the ROI to the contamination detected in the samples. The details of the risk assessments are documented in five RI Reports (NASA, 2008b, 2009a, 2009b; MWH, 2009c, 2007b), and the COCs identified at each of the NASA sites are provided in Table 3.8-2. Table 3.9-1 shows the sites that would require cleanup based on the various exposure scenarios. For example, the LOX plant would require cleanup in certain areas for all risk-based scenarios, while the Area II landfill would not require cleanup for industrial or recreational receptors.

TABLE 3.9-1
**Onsite Exposure Risk Assessment Summary**
*NASA SSFL EIS for Proposed Demolition and Environmental Clean Up*

| Site Name | Contaminant Risk Drivers | Potential Risk to Receptor? | | | |
|---|---|---|---|---|---|
| | | **Residential** | **Industrial** | **Recreational** | **Ecological** |
| **Group 2** | | | | | |
| LOX Plant | VOCs, PAHs, metals | Y | Y | Y | Y |
| Area II Landfill | SVOCs, dioxins, PAHs, PCBs | Y | N | N | Y |
| ELV | VOCs, dioxins, PCBs, mercury | Y | Y | N | Y |
| Ash Pile and STP | VOCs, dioxins, metals | Y | N | N | Y |
| **Group 3** | | | | | |
| Building 204 | Dioxins | Y | Y | Y | Y |
| SPA | VOCs, SVOCs | Y | N | N | N |
| Alfa/Bravo Fuel Farm | Arsenic | Y | Y | Y | N |
| Bravo Area | VOCs, PAHs, PCBs, cadmium | Y | Y | Y | N |
| Alfa Area | VOCs, PCBs, arsenic, chromium | Y | Y | Y | Y |
| Skyline Road Area | Dioxins | Y | N | N | N |
| Hazardous Waste Coolant Tank | None identified | N | N | N | N |
| **Group 4** | | | | | |
| Coca Area | VOCs, metals | Y | Y | Y | Y |
| Delta Area | VOCs, metals | Y | N | N | Y |
| Propellant Load Facility | None identified | N | N | N | N |
| **Group 9** | | | | | |
| Coca/Delta Fuel Farm | VOCs, SVOCs, PCBs, metals, dioxins | Y | Y | N | Y |
| R-2 Ponds Area | VOCs, SVOCs, dioxins, metals | Y | Y | Y | Y |

In general, risk-based protocols are designated for each of these cleanup levels to help assess the possible ways in which people and animals (receptors) could be exposed to soil and groundwater contaminants and the health risks associated with that exposure. A receptor must have the potential for exposure to the contaminated soil for a risk to be present. After the potential for exposure to receptors has been confirmed, the extent of exposure can be evaluated using different criteria, including the duration of exposure, the type of contamination to which a sensitive receptor would be exposed, the frequency of exposure, and the relative toxicity of the contaminant. That is, based on the number of days a receptor is on SSFL, the areas the receptor might access, and the conditions of the site, a risk-based protocol would be established that would designate the cleanup level necessary to keep that receptor healthy and safe.

The exposure scenario for a Suburban Residential cleanup assumes that both adults and children would be exposed to soil and groundwater at a home. The exposure duration is assumed to be 24 hours per day, 350 days per year, for a total of 30 years. The media to which the residents would be exposed include surface soil (0 to 2 ft) and subsurface soil to a depth of 10 ft (assuming that the home has a basement). The exposure route for soil would include accidental ingestion, inhalation of soil particles, and dermal contact. It is assumed that the residents would be exposed to vapors in the soil gas from the subsurface soil via a process known as vapor intrusion. Based on the human health risk assessment conducted for the draft RFI and RI Reports for Groups 2, 3, 4, and 9 (see DTSC website http://www.dtsc-ssfl.com/default.asp?V_DOC_ID=941), the footprint of the area requiring soil cleanup is estimated to be 18 acres (see Table 2.4-1 for more information). The depth of soil that would require cleanup varies on a site-by-site basis; generally, it is less than 5 ft, but can reach 20 ft in limited areas.

The exposure scenario for Commercial/Industrial soil cleanup assumes that adults would be exposed to soil and vapors while at work. The exposure duration is assumed to be 8 to 10 hours per day, 250 days per year, for a total of 25 years. The media to which the residents would be exposed include surface soil (0 to 2 ft) and subsurface soil to a depth of 10 ft. The exposure route for soil would include accidental ingestion, inhalation of soil particles, and dermal contact. The evaluation uses the assumption that the workers would be exposed to vapors in the soil gas from the subsurface soil and groundwater via the vapor intrusion pathway. The depth of soil that would require cleanup varies on a site-by site-basis; generally it is less than 5 ft, but can reach 20 ft in limited areas.

The exposure scenario for Recreational cleanup assumes that both adults and children are exposed to soil and groundwater while performing recreational activities. The exposure duration is assumed to be several hours per day, 50 days per year, for a total of 30 years. The media to which the recreationists would be exposed include surface soil (0 to 2 ft) and subsurface soil to a depth of 10 ft. The exposure routes for soil would include accidental ingestion, inhalation of soil particles, and dermal contact. The analysis assumes that recreationists would be exposed to vapors in the soil gas from the subsurface soil and groundwater via vapor intrusion.

Ecological risk assessments (ERAs) identify those contaminants of ecological concern that pose potential risk to the ecological receptors and might require additional action or evaluation. ERAs often contain detailed information regarding the contact or co-occurrence of stressors with the biological community at a site. Exposure profiles are developed to identify ecological receptors, habitats, and pathways of exposure. Complete or potentially complete exposure pathways from contaminated soil, sediment, surface water, and biota to ecological receptors may exist at each site. Contaminants in soil may be directly bioaccumulated by terrestrial and aquatic/semi-aquatic plants, invertebrates, birds, and small mammals resident in and associated with the site soils, sediments, or surface water. Terrestrial and semi-aquatic birds and other wildlife (herbivores, omnivores, invertivores, and carnivores) may be exposed directly to contaminants in soil, sediments, or surface water by incidental ingestion, dermal contact, or inhalation of volatiles or wind-borne particles. Terrestrial and semi-aquatic wildlife (focusing on birds and mammals) also may receive contaminant exposure through food-web transfer of chemicals from lower trophic levels (plants to herbivores, plants and prey animals to omnivores, etc.).

### 3.9.6 Offsite Health Hazards

The potential offsite health risks posed by the operations conducted at SSFL have been evaluated by numerous studies over the years. In a public statement DTSC concluded the following, "DTSC has conducted extensive reviews of environmental data relating to the Santa Susana Field Laboratory, including data collected by other government agencies, such as USEPA. These data include environmental measurements relating to air, soil, groundwater, surface water, and drinking water. To date, DTSC has not found any evidence of off-site contamination from the SSFL that has posed or would pose a risk to users of the Santa Susana Pass State Historic Park or residents of neighborhoods near the SSFL." DTSC has documented the results of 14 studies and posted them on its website (http://www.dtsc.ca.gov/SiteCleanup/Santa_Susana_Field_Lab/SantaSusanaFieldLabFAQ.cfm) in a report titled *Summary of Cancer Study and Exposure Assessment Activities and Document Release Dates Related to the Santa Susana Field Lab (Rocketdyne) Site*. The studies have been conducted or reviewed by the following organizations:

- California Department of Health Services (CDHS)
- University of California, Los Angeles (UCLA)
- Tri-Counties Regional Cancer Registry

- California Environmental Protection Agency (Cal/EPA)
- Agency for Toxic Substances and Disease Registry (ASTDR)
- The Boeing Company (International Epidemiology Institute, Vanderbilt University and Vanderbilt-Ingram Cancer Center, Oak Ridge Associated Universities, Oak Ridge National Laboratory, Lovelace Respiratory Research Institute, and University of Southern California, Los Angeles)
- SSFL Advisory Panel funded by the California State Legislature through the Citizens' Monitoring and Technical Assistance Fund
- California Cancer Registry

Of the 14 studies that were conducted, two were focused on radiological effects, and NASA did not conduct operations that would have resulted in radiation releases. Three of the UCLA studies and the Boeing study were focused on potential cancer incidents associated with former workers and not related to offsite health effects. One of the studies evaluated additional investigations that should be conducted to evaluate offsite exposures and did not assess the potential offsite exposures related to operations at SSFL. The results of the remaining studies addressing offsite health effects are summarized here.

A study conducted by the CDHS reviewed cancer among the residents living in five census tracts located in Los Angeles County within 5 miles of SSFL. The study concluded:

> *Given the large number of comparisons made (five census tracts, two time periods, eleven sites), these findings are consistent with random variation in cancer incident rates*.

One of the Tri-Counties Regional Cancer Registry studies concluded:

> *The cancers examined were the same as the CDHS 1992 study except salivary and parathyroid gland cancers were not included in the 'possibly radiosensitive.' They found that the residents of the study area appeared to have cancer incidence risk similar to that of the other residents of the Tri-Counties Region, except for leukemia in women which was significantly lower, and cancer of the lung & bronchus which is higher.*

The second Tri-Counties Regional Cancer Registry publication was in response to an inquiry about cancer incidents in Simi Valley. The response indicated:

> *The occurrence of newly diagnosed invasive cancers in the identified census tract did not show any unusual pattern, but rather had decreased between 1988 and 2004.*

The three studies conducted by CDHS were reviewed by Cal/EPA and it was found that the "combined evidence from all three studies did not indicate an increased rate of cancer incidence in the regions examined." The investigation report further noted that "The results do not support the presence of any major environmental hazard."

The study conducted by ASTDR concluded the following:

> *Although chemicals and radionuclides were released from the site, the likelihood of those releases resulting in human exposure is limited by a number of factors, including; 1) the distance from the release sources to the offsite residential areas that results in rapid dispersion and degradation of oxidants and solvents in air; 2) the predominant wind patterns that normally blow away from the nearest residential areas; 3) other meteorological conditions at the site such as the atmospheric mixing height; and 4) drawdowns in ground water levels that reduce the rates of contaminant migration. Considering these factors, it is unlikely that residents living near the site are, or were exposed to SSFL-related chemicals and radionuclides at levels that would result in adverse human health effects. Changes in site operations, such as reduced frequency of rocket engine testing, discontinuation of trichloroethylene use, and shut down of nuclear operations make it unlikely that future exposures to the offsite community will occur.*

The conclusions of the study did recommend that additional evaluation be conducted of exposure pathways that may affect offsite areas.

The results from a UCLA study funded by ASTDR evaluated the incidence of cancer for populations between 2 to 5 miles of SSFL during two different time periods (1988–1995 and 1996–2002). The results indicated there was no association between distance from SSFL for total and radiosensitive cancers among adults. However, the incidence rate of chemo-sensitive cancers was slightly elevated during both time frames for populations living within 2 miles of SSFL. Specifically, the standardized incidence rate ratio was greater than 1.6 for cancers of blood and lymph tissue, bladder, thyroid, and upper aero-digestive tract for the time period of 1988 through 1996. Between 1996 and 2002, the rate ratio among persons living within 2 miles of SSFL was greater than 1.6 for primarily thyroid cancer (some incidents of lung and upper digestive tract cancers) and less than 1.2 for other cancers. However, the overall conclusion of the study indicated the following:

> *It is important to recognize that the distance from SSFL and the incidence of specific cancers are based on small numbers of cases within strata of the regions closest to SSFL. Thus, precision of effect estimation is often poor (resulting in wide confidence intervals), and statistical power for detecting effects is low—which implies that some of our estimates may be chance finding and should be interpreted cautiously. Furthermore, we have no direct evidence that the associations we observed—even if they reflect real differences among the three regions—necessarily reflect the effects of environmental exposures originating at SSFL.*

The California Cancer Registry performed a study of the incidences of retinoblastoma in children in Los Angeles and Ventura counties. The study concluded that the number of cancer incidents expected was calculated to be 7.5, and the number of cases observed was 11. The number of reported incidences observed was within the 99-percent confidence interval (4.3 to 22.8); therefore, it was concluded that the "incidence of retinoblastoma in the area of interest was not statistically significantly elevated."

## 3.10 Traffic and Transportation

This subsection addresses the affected traffic and transportation environment surrounding SSFL, including the existing conditions for regional and local transportation facilities, traffic conditions and level-of-service analysis, and transit network. Railroads and airports were found to be unaffected by the Proposed Action. Therefore, as discussed in Section 2.5, these transportation-related resources were eliminated from further analysis.

The primary ROI for transportation and traffic includes local access routes to the project site in both Los Angeles and Ventura counties. For heavy vehicles, the regional and local roadway network within the primary ROI includes Woolsey Canyon Road, Valley Circle Boulevard, Roscoe Boulevard, State Route (SR) 118, SR 27 (Topanga Canyon Road), and U.S. 101. For construction worker vehicles, the local access routes include Plummer Street, Box Canyon Road, and Santa Susana Pass Road, in addition to the roadways identified for heavy vehicles. Roadways within SSFL also are included in the primary ROI.

The secondary ROI for transportation and traffic includes regional access routes to the project site and potential dump or landfill sites for construction and hazardous wastes. These routes are expected to include Interstate (I)-405, I-5, I-210, and SR 14. Some heavy vehicles carrying waste or equipment or bringing in treatment equipment might travel on roadways outside California to destinations in Nevada and Utah, or transfer the waste to freight rail traveling to the same destinations. Roadways near landfill sites have not been included, because the project-related volume would be low relative to the available capacity or the existing volume on the facility.

### 3.10.1 Existing Conditions

#### 3.10.1.1 Regional and Local Transportation Facilities

The following discussion summarizes the existing roadways in the primary SSFL ROI and nearby facilities in the secondary SSFL ROI, including existing configurations, traffic volumes, and operating conditions. These are the main roadways that heavy trucks or crew members accessing SSFL would use. Figure 3.10-1 shows the regional and local roadway network within the primary ROI.

## Primary ROI

### *Freeways*

**U.S. 101.** U.S. 101, which has an east-west alignment in the vicinity of SSFL, is 5 miles south of SSFL. U.S. 101 connects with I-5 in downtown Los Angeles to the south and with San Luis Obispo, San Jose, and San Francisco to the north. In the vicinity of the project site, U.S. 101 is an 8- to 10-lane roadway. According to traffic counts published by the California Department of Transportation (Caltrans) in 2011, the average daily traffic volume at the SR 27/Topanga Canyon Blvd. interchange was 228,000 vehicles per day (Caltrans, 2011).

### *Other State Highways*

**SR 118.** SR 118 is an east-west route approximately 3 miles north of SSFL. SR 118 connects with I-210 to the east and terminates at the SR 126 interchange to the west. Near SSFL, SR 118 is a 10-lane roadway. According to traffic counts published by Caltrans in 2011, the average daily traffic volume at the SR 27/Topanga Canyon Boulevard. interchange was 126,000 vehicles per day (Caltrans, 2011).

**SR 27/Topanga Canyon Boulevard.** This road is a north-south route approximately 4 miles east of SSFL. SR 27 connects with SR 118 to the north and SR 1 (Pacific Coast Highway) to the south. Near SSFL, SR 27 is generally a six-lane roadway. According to traffic counts published by Caltrans in 2011, the average daily traffic volume at the Roscoe Boulevard intersection was 47,500 vehicles per day (Caltrans, 2011).

### *Arterial Streets*

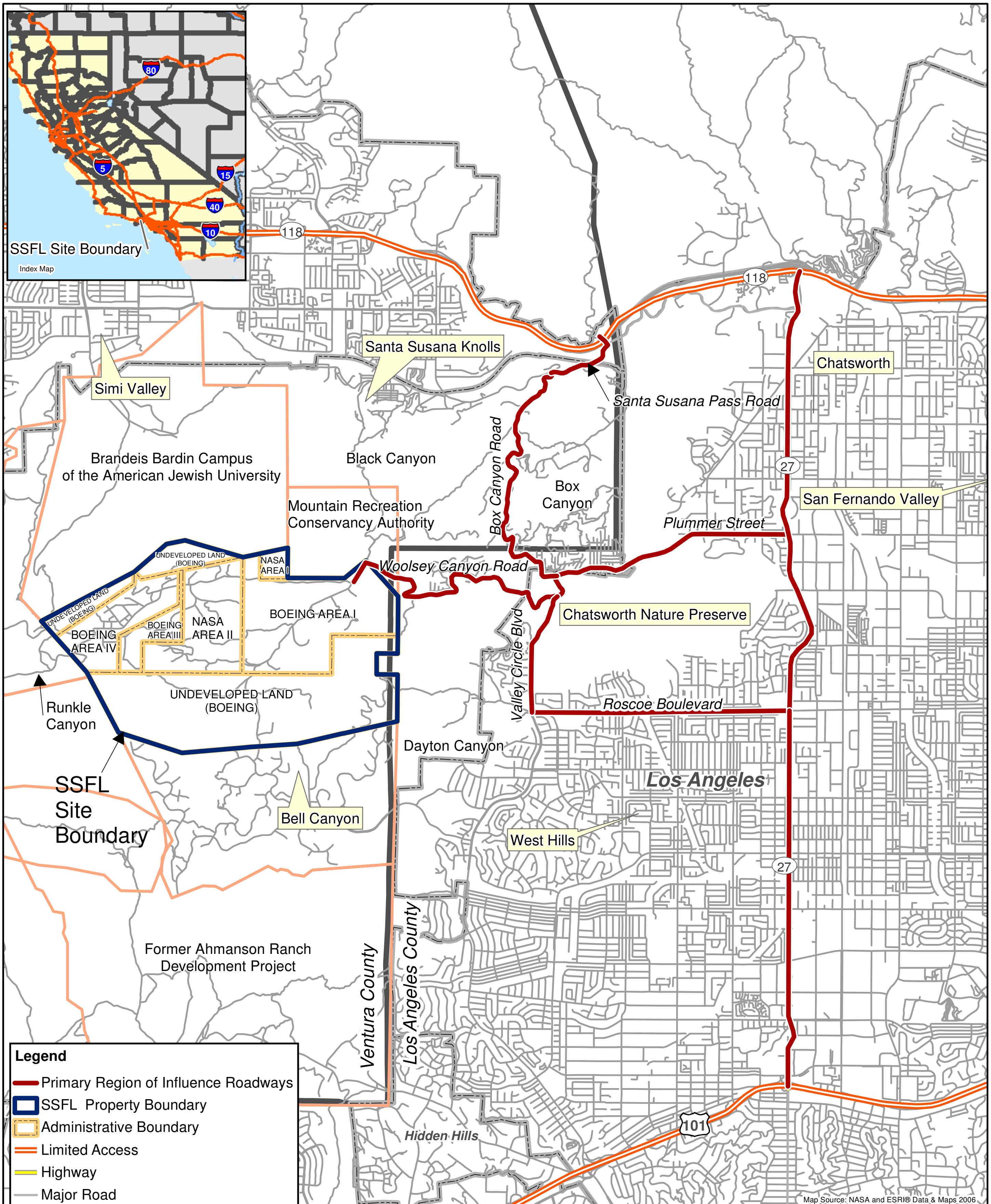
**Roscoe Boulevard.** Roscoe Boulevard is an east-west collector street in Los Angeles County, approximately 2 miles southeast of SSFL. Roscoe Boulevard connects Valley Circle Boulevard to Topanga Canyon Boulevard/SR 27. Near SSFL, Roscoe Boulevard is a two- to-five-lane roadway. Traffic counts conducted by DOE in 2011 indicated an average daily traffic volume near the Topanga Boulevard intersection of 6,450 vehicles per day (CDM/SAIC, 2011).

**Woolsey Canyon Road.** Woolsey Canyon Road, an east-west local street in Los Angeles County that connects the primary project site entrance to Valley Circle Boulevard, is a two-lane road. Traffic counts conducted by DOE in 2011 indicate an average daily traffic volume of 1,500 vehicles per day (CDM/SAIC, 2011).

**Valley Circle Boulevard.** Valley Circle Boulevard is a north-south local street in Los Angeles County, approximately 1.5 miles east of SSFL. Valley Circle Boulevard connects Woolsey Canyon Road to Roscoe Boulevard, Plummer Street, and Box Canyon Road. Valley Circle Boulevard is a two-lane roadway. The most recent traffic count on Valley Circle Boulevard near SSFL was conducted in 2005. Historical traffic counts indicate an annual growth rate of 2.4 percent along Valley Circle Boulevard. Applying this growth rate to the 2005 traffic count yields an estimated average daily traffic volume of 10,600 vehicles per day in 2010 (CDM/SAIC, 2011).

**Plummer Street.** Plummer Street is an east-west collector street in Los Angeles County approximately 3 miles east of SSFL. Plummer Street, which connects Valley Circle Boulevard to Topanga Canyon Boulevard/SR 27, is a three- to four-lane roadway. Traffic counts conducted by DOE in 2011 indicated an average daily traffic volume of 4,200 vehicles per day (CDM/SAIC, 2011).

**Box Canyon Road.** Box Canyon Road is a north-south local street approximately 1.5 miles east of SSFL. Box Canyon Road, which connects Valley Circle Boulevard in Los Angeles County to Santa Susana Pass Road in Ventura County, is a two-lane facility. Traffic counts conducted by Caltrans in 2010 indicated an average daily traffic volume of 4,000 vehicles per day (Ventura County, 2011).




0 0.5 1 2 Miles

0 0.75 1.5 3 Kilometers

24-Feb-2014
Drawn By:
A. Cooley
D. Scott Stevens

**Figure 3.10-1**
**Transportation Network within the Primary Region of Influence**
**NASA - Santa Susana Field Laboratory**
**EIS for Proposed Demolition and Environmental Cleanup**

Map Document: O:\NASA\SSFL\maps\EIS_2011\SSFL_Regional_ROI_Transportation.mxd

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**Santa Susana Pass Road.** Santa Susana Pass Road is an east-west local street in Ventura County, approximately 2.5 miles northeast of the project site. For project purposes, Santa Susana Pass Road connects Box Canyon Road to SR 118 and is a two-lane road. Traffic counts conducted by Caltrans in 2010 indicated an average daily traffic volume of 5,200 vehicles per day (Ventura County, 2011).

***Roadways within SSFL***

**Facility Road, Service Area Road, Skyline Drive, Test Area Road, and Other Roads.** Roadways within SSFL include both paved and unpaved roads. Paved roadways generally provide one lane of travel in each direction with limited shoulder area. Unpaved roadways generally provide a single lane of travel with no shoulder. Traffic volumes vary depending on the types of activities occurring on the site. Access to SSFL and the use of these roadways are restricted to Boeing, DOE, and NASA operations.

**Secondary Region of Influence**

***Freeways***

**Interstate 5.** I-5 is a north-south freeway approximately 15 miles east of SSFL. I-5 connects the Canadian and Mexican borders through the major metropolitan areas of Seattle, Portland, Sacramento, Los Angeles, and San Diego. Near SSFL, I-5 is generally a 10- to 12-lane roadway. According to traffic counts published by Caltrans in 2011, the average daily traffic volume at the SR 118 interchange was 276,000 vehicles per day.

**Interstate 210.** I-210 is an east-west freeway approximately 21 miles east of SSFL. I-210 connects with I-5 to the north, near the City of Los Angeles' border, and with I-10 in the City of Redlands. In the vicinity of SSFL, I-210 is generally an eight-lane roadway. According to traffic counts published by Caltrans in 2011, the average daily traffic volume at the La Tuna Canyon interchange, about 25 miles from SSFL, was 112,000 vehicles per day.

**Interstate 405.** I-405 is a north-south freeway approximately 12 miles east of SSFL. I-405 connects with I-5 to the north, near the city of Los Angeles' border, and with I-5 to the south within the City of Irvine. Near SSFL, I-405 is generally a 10-lane roadway. According to traffic counts published by Caltrans in 2011, the average daily traffic volume at the SR 118 interchange was 213,000 vehicles per day.

***Other State Highways***

**State Route 14.** SR 14 is an east-west route approximately 12 miles northeast of the project site. SR 14 connects with U.S. 395 near Inyokern to the north and with I-5 near the Los Angeles' border to the south. Near the project site, SR 14 is generally an 8- to 10-lane roadway. According to traffic counts published by Caltrans in 2011, the average daily traffic volume at the I-5 interchange was 155,000 vehicles per day.

### 3.10.1.2 Existing Traffic Conditions and Level-of-Service Analysis

NASA conducted this evaluation according to the methodologies and procedures outlined in the *Highway Capacity Manual* (HCM) (Transportation Research Board, 2000), and applicable provisions from NEPA. NASA evaluated the local streets based on average daily traffic conditions and the freeways based on peak hour traffic conditions. The analysis was based on traffic counts collected by the DOE and Caltrans in 2010 and 2011.

**Existing Roadway and Intersection Conditions**

The 2000 HCM includes a set of criteria for assessing the performance of the highway systems and the capacity of roadways by measuring the flow of traffic. For roadway segment operations, the volume to capacity (V/C) ratio is a general indicator for traffic flow characteristics. Table 3.10-1 lists the roadway traffic flow characteristics for different level-of-service (LOS) values. Table 3.10-2 lists the LOS thresholds for facilities within the primary ROI by jurisdiction. The Los Angeles County Transportation Element (County of Los Angeles, 1980) was last updated in 1980. The City of Los Angeles Transportation Element was last updated in 1999. At that time, neither document explicitly identified roadway LOS thresholds. The Los Angeles Metro 2010 Congestion Management Program (LA Metro, 2010) identifies LOS E as the LOS threshold for arterials within the city and county of Los Angeles. Ventura County identifies LOS C as the mobility threshold for county-maintained local roads. For planning purposes, Caltrans identifies LOS D as an acceptable mobility threshold.

TABLE 3.10-1
**Level of Service Characteristics**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| LOS | Volume to Capacity (V/C) Ratio | Traffic Flow Characteristics |
|---|---|---|
| A | 0.00-0.60 | Highest quality of service. Free traffic flow, with low volumes and densities. Little or no restriction on maneuverability or speed. |
| B | >0.60-0.70 | Stable traffic flow, speed becoming slightly restricted. Low restriction on maneuverability. |
| C | >0.70-0.80 | Stable traffic flow, but less freedom to select speed, change lanes, or pass. Density increasing. |
| D | >0.80-0.90 | Approaching unstable flow. Speeds tolerable, but subject to sudden and considerable variation. Less maneuverability and driver comfort. |
| E | >0.90-1.00 | Unstable traffic flow with rapidly fluctuating speeds and flow rates. Short headways, low maneuverability, and low driver comfort. |
| F | >1.00 | Forced traffic flow. Speed and flow might drop to zero with high densities. |
| Source: LA Metro Congestion Management Program (2010) | | |

TABLE 3.10-2
**Level of Service Threshold by Jurisdiction**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Jurisdiction | Level of Service (LOS) Threshold | Volume to Capacity (V/C) Ratio Threshold |
|---|---|---|
| Caltrans | D | 0.90 |
| Los Angeles County | E | 1.00 |
| City of Los Angeles | E | 1.00 |
| Ventura County | C | 0.80 |
| Source: LA Metro (2010); Ventura County (2011) | | |

This evaluation is based on average daily capacities for the local roadways and peak hour two-way volumes for state highways within the primary ROI. Arterial roadway capacities are based on the Florida Department of Transportation (FDOT) *Level of Service Handbook* (2009), which is the accepted nationwide standard and provides estimates for daily roadway capacities based on the roadway characteristics. The capacity of a freeway was assumed to be 2,000 vehicles per lane. Vehicle volumes were obtained from counts conducted by the DOE and Caltrans in 2010 or 2011. Table 3.10-3 lists the existing conditions of freeway facilities within the primary ROI; the local facilities are provided in Table 3.10-4. Currently, within the primary ROI, only southbound US 101 is operating at a level greater than the mobility threshold (LOS D for state highways).

TABLE 3.10-3
**Traffic Conditions along Primary Region of Influence Freeways**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Roadway Segment | Direction | Peak Hour Volume[a] | Peak Hour Capacity | V/C Ratio | LOS | Meets LOS Threshold? |
|---|---|---|---|---|---|---|
| SR 118 (at Topanga Boulevard Interchange) | EB | 5,220 | 8,000 | 0.65 | B | Yes |
| | WB | 4,840 | 8,000 | 0.61 | B | Yes |
| US 101 (at Topanga Boulevard Interchange) | NB | 7,170 | 8,000 | 0.90 | D | Yes |
| | SB | 7,450 | 8,000 | 0.93 | E | No |

Notes:
EB = east bound
NB = north bound
SB = south bound
WB = west bound

[a] Caltrans Freeway Performance Measurement System (PeMS) Traffic Data (2011)

TABLE 3.10-4
**Traffic Conditions of Arterial Roadways within Region of Influence**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Roadway Segment | ADT [a] | ADT Capacity [b] | LOS | Meets LOS Threshold? |
|---|---|---|---|---|
| Topanga Canyon Boulevard | 47,500 | 50,445 | E | Yes |
| Roscoe Boulevard | 6,450 | 15,390 | B | Yes |
| Valley Circle Boulevard | 10,600 | 11,550 | D [c] | Yes |
| Plummer Street | 4,200 | 15,675 | B | Yes |
| Woolsey Canyon Road | 1,500 | 11,550 | B | Yes |
| Box Canyon Road | 4,000 | 11,550 | B | Yes |
| Santa Susana Pass Road | 5,200 | 11,550 | B | Yes |

Notes:
[a] ADT = average daily traffic; 2010 Caltrans Traffic Counts
[b] FDOT (2009)
[c] FDOT *Level of Service Handbook* indicates LOS D as the roadway capacity

### 3.10.1.3 Public Transit Network

LA Metro operates transit service within Los Angeles County. Within the primary ROI, Routes 152 and 353 operate along Roscoe Boulevard and Routes 245, 150, 645, and 750 operate along Topanga Canyon Boulevard. In addition, Route 791, operated by Santa Clarita Transit, Route 787 operated by Antelope Valley Transit Authority, and Route 422 operated by Los Angeles Department of Transportation Commuter Express, operate along Topanga Canyon Boulevard.

# 3.11 Noise

This subsection describes the existing noise conditions at and around SSFL. The ROI for noise includes local access routes to the entrance of SSFL, as well as within the boundaries of SSFL. This ROI includes Woolsey Canyon Road, Valley Circle Boulevard, Roscoe Boulevard, SR 118, U.S. 101, and local arterial roads including Plummer Street, and Box Canyon Road (Figure 3.11-1).

## 3.11.1 Background Information

Acoustics is the study of sound, and noise is defined as unwanted sound. Table 3.11-1 provides a summary of the acoustical terms used in this subsection. Airborne sound is a rapid fluctuation or oscillation of air pressure above and below atmospheric pressure, which creates a sound wave. Table 3.11-2 provides information about noise limits per the Los Angeles County Noise Control Ordinance (Ord. 11778 and Ord. 11773; County of Los Angeles, 2012), which covers the roadway network accessing SSFL.

The most common metric is the overall A-weighted sound level measurement, which regulatory bodies worldwide have adopted. The A-weighting network measures sound similar to how a person perceives or hears sound, thereby providing a good measure for evaluating acceptable and unacceptable sound levels.

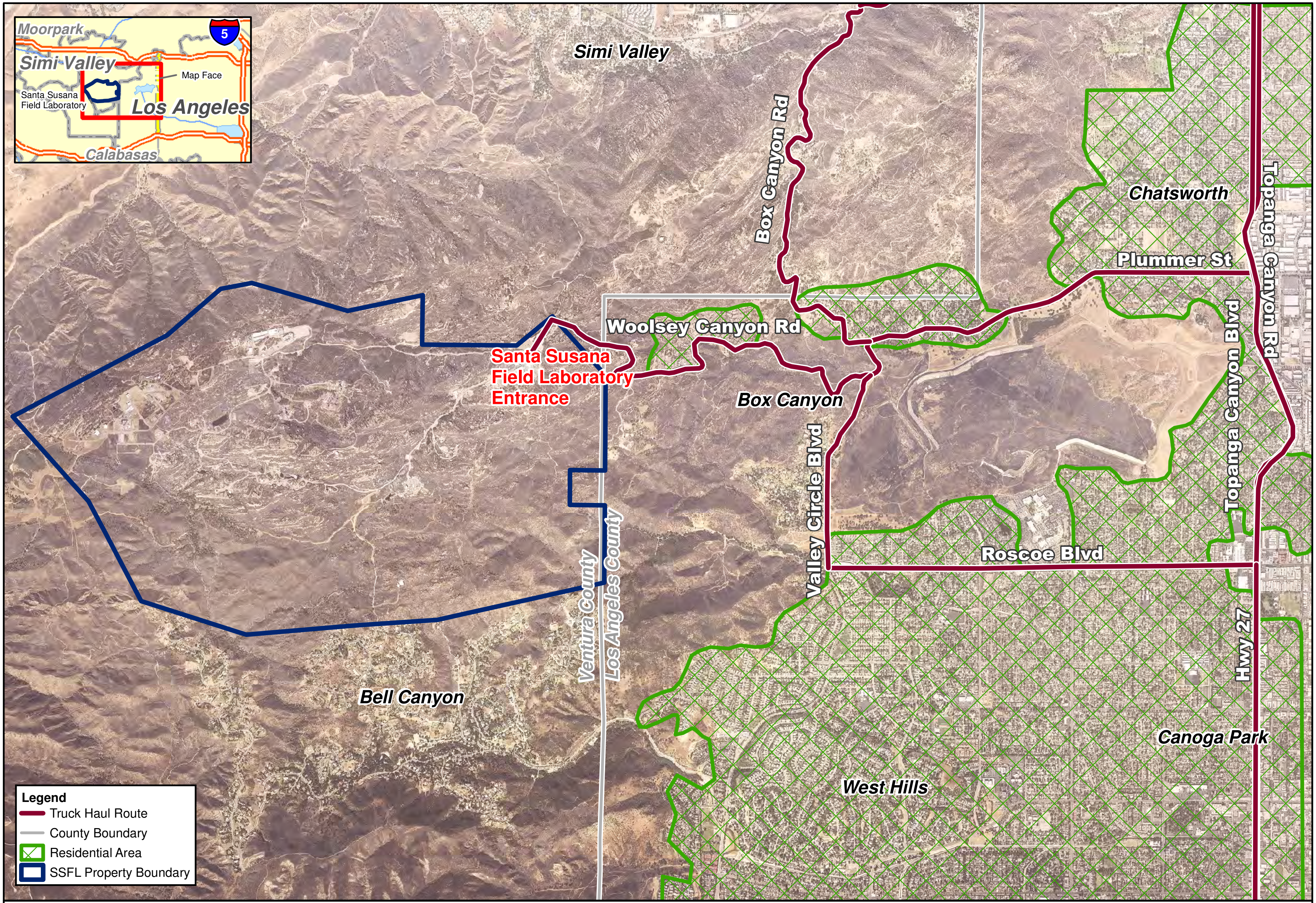
The following are the general categories of the effects of noise on people:

- Subjective effects of annoyance, nuisance, and dissatisfaction
- Interference with activities such as speech, sleep, and learning
- Physiological effects such as startling and hearing loss

Table 3.11-3 lists the relative A-weighted noise levels of common sounds measured in the environment and in industry for various sound levels.

## 3.11.2 Existing Conditions

Noise-sensitive land uses generally are defined as locations where people reside or where the presence of unwanted sound adversely could affect the designated use of the land. Figure 3-11-1 shows SSFL and the surrounding communities. Typically, noise-sensitive land uses include residential areas, hospitals, places of worship, libraries, and schools, as well as nature and wildlife preserves and parks. Noise sensitive locations in the ROI include the residential areas along the haul routes including Woolsey Canyon Road, Roscoe Boulevard, Plummer Street, and Topanga Canyon Boulevard. The existing noise environment in the ROI primarily consists of occasional aircraft over flights and traffic noise on the local roadways and includes a mix of automobiles and medium and heavy trucks.




0 1,250 2,500 5,000 Feet
0 350 700 1,400 Meters

02-Jul-2013
Drawn By:
A. Cooley

Figure 3.11-1
Noise Region of Influence
NASA - Santa Susana Field Laboratory
EIS for Proposed Demolition and Environmental Cleanup

Map Document: O:\NASA\SSFL\maps\EIS_2011\EIS_NoiseSensitiveLocs_SDE.mxd

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TABLE 3.11-1
**Definitions of Acoustical Terms**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Term | Definition |
|---|---|
| Ambient Noise Level | The composite of noise from all sources near and far. The normal or existing level of environmental noise or sound at a given location. The ambient level typically is defined by the $L_{eq}$ level. |
| Background Noise Level | The underlying ever-present lower level noise that remains in the absence of intrusive or intermittent sounds. Distant sources, such as traffic, typically make up the background. The background level is generally defined by the $L_{90}$ percentile noise level. |
| Sound Pressure Level Decibel (dB) | A unit describing the amplitude of sound, equal to 20 times the logarithm to the base 10 of the ratio of the pressure of the sound measured to the reference pressure, which is 20 micropascals. |
| Sound Pressure Level in Decibels (A-weighted) (dBA) | The sound level in decibels as measured on a sound level meter using the A-weighted filter network. The A-weighted filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise. All sound levels in this report are A-weighted. |
| Equivalent Noise Level ($L_{eq}$) | The average A-weighted noise level, on an equal energy basis, during the measurement period. |
| Day-Night Noise Level ($L_{dn}$ or DNL) | The average A-weighted noise level during a 24-hour day, obtained after the addition of 10 decibels from 10:00 p.m. to 7:00 a.m. |

Notes:
$L_{eq}$ = The descriptor most commonly used in environmental noise analysis that is the equivalent steady state sound level. This value is representative of the same amount of acoustic energy that is contained in a time-varying sound measurement over a specified period of time. The average of multiple sounds is measured during a specific time period. The average measurement results in one sound measurement representative of all the sound measured in the time period.

TABLE 3.11-2
**Los Angeles County Noise Limits**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Time | Noise Limits (dBA) | | |
|---|---|---|---|
| | **Single-Family Residential** | **Multi-Family Residential** | **Semi-Residential/ Commercial** |
| **Mobile Equipment** | | | |
| Daily, except Sundays and legal holidays, 7:00 a.m. to 8:00 p.m. | 75 | 80 | 85 |
| Daily, 8:00 p.m. to 7:00 a.m. and all day Sunday and legal holidays | 60 | 65 | 70 |
| **Stationary Equipment** | | | |
| Daily, except Sundays and legal holidays, 7:00 a.m. to 8:00 p.m. | 60 | 65 | 70 |
| Daily, 8:00 p.m. to 7:00 a.m. and all day Sunday and legal holidays | 50 | 55 | 60 |
| Source: Noise Control Ordinance of the Los Angeles County (Ord. 11778 and Ord. 11773) (1974) | | | |

TABLE 3.11-3
**Typical Sound Levels Measured in the Environment and Industry**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Noise Source at a Given Distance | A-Weighted Sound Level in Decibels (dBA) | Subjective Impression |
|---|---|---|
| Loud rock music | 110 | |
| Jet flyover at 1,000 ft | 100 | Very loud |
| Gas lawnmower at 3 ft | 90 | |
| Garbage disposal at 3 ft | 80 | |
| Vacuum cleaner at 10 ft | 70 | Moderately loud |
| Heavy traffic at 300 ft | 60 | |
| Dishwasher in next room | 50 | |
| Quiet urban nighttime | 40 | Quiet |
| Library | 30 | |
| | 20 | |
| Recording studio | 10 | Threshold of hearing |
| Source: Technical Noise Supplement (Caltrans, 2009) | | |

# 3.12 Environmental Justice

This subsection describes the affected environment associated with low-income and minority populations and the protection of children.

Environmental justice is the fair treatment of people of all races, income, and cultures with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Environmental justice further requires meaningful involvement of these groups in the decision-making processes of the government. Environmental justice has its origins with Title VI of the Civil Rights Act of 1964, which states: “No person in the United States shall, on the ground of race, color, or national origin be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving federal financial assistance.”

In 1994, President Clinton issued EO 12898, “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,” providing a renewed emphasis to Title VI and adding low-income populations to those protected by the principles of environmental justice. EPA has lead responsibility for implementing this EO as Chair of the Interagency Working Group on Environmental Justice.

A growing body of scientific knowledge has demonstrated that children might suffer disproportionately from environmental health and safety risks. These risks arise because children are still developing; children eat more food, drink more fluids, and breathe more air in proportion to their body weight than adults; children's size and weight might diminish their protection from standard safety features; and children's behavior patterns could make them more susceptible to accidents. EO 13045, “Protection of Children from Environmental Health Risks and Safety Risks,” issued 3 years after EO 12898, addresses these potential health and safety risks to children.

The ROI for environmental justice encompasses populations that might be affected by the implementation of the proposed demolition and environmental remediation alternatives. For the purposes of this environmental justice analysis, the ROI is defined as the census block groups adjacent to the SSFL property or truck routes on local roads that would be affected by additional work crew and heavy truck traffic. The block groups that make up those tracts are within approximately 1 mile of the SSFL boundary or the truck routes. A block group is part of a census tract. A census tract may contain one or more block groups. Figure 3.12-1 shows the tracts and Figure 3.12-2 shows the block groups.

The affected environment for environmental justice is defined using demographic data to identify minority and low-income populations, as well as the presence of children that could be affected disproportionately by the proposed activities. NASA used the most recent data available from the U.S. Census, primarily from Census 2010, the 2007 to 2011 American Community Survey 5-Year Summary (U.S. Census Bureau, 2011a, 2011b, 2011c, 2011d), and U.S. Census Bureau 2013 Quick Facts for Los Angeles and Ventura counties (U.S. Census Bureau 2013a and 2013b) for this analysis.

This analysis identified 51 block groups in Ventura County and Los Angeles County that are either adjacent to SSFL or near local roads that would be affected by additional project-related traffic. The total population of these 51 block groups is 93,320 persons. Furthermore, as requested by the local community, the block group containing Summit and Mountain View Mobile Home Communities, 24425 Woolsey Canyon Road, Canoga Park, California, specifically was analyzed. The block group comprises the entire census tract 1132.35 (Figure 3.12-1).

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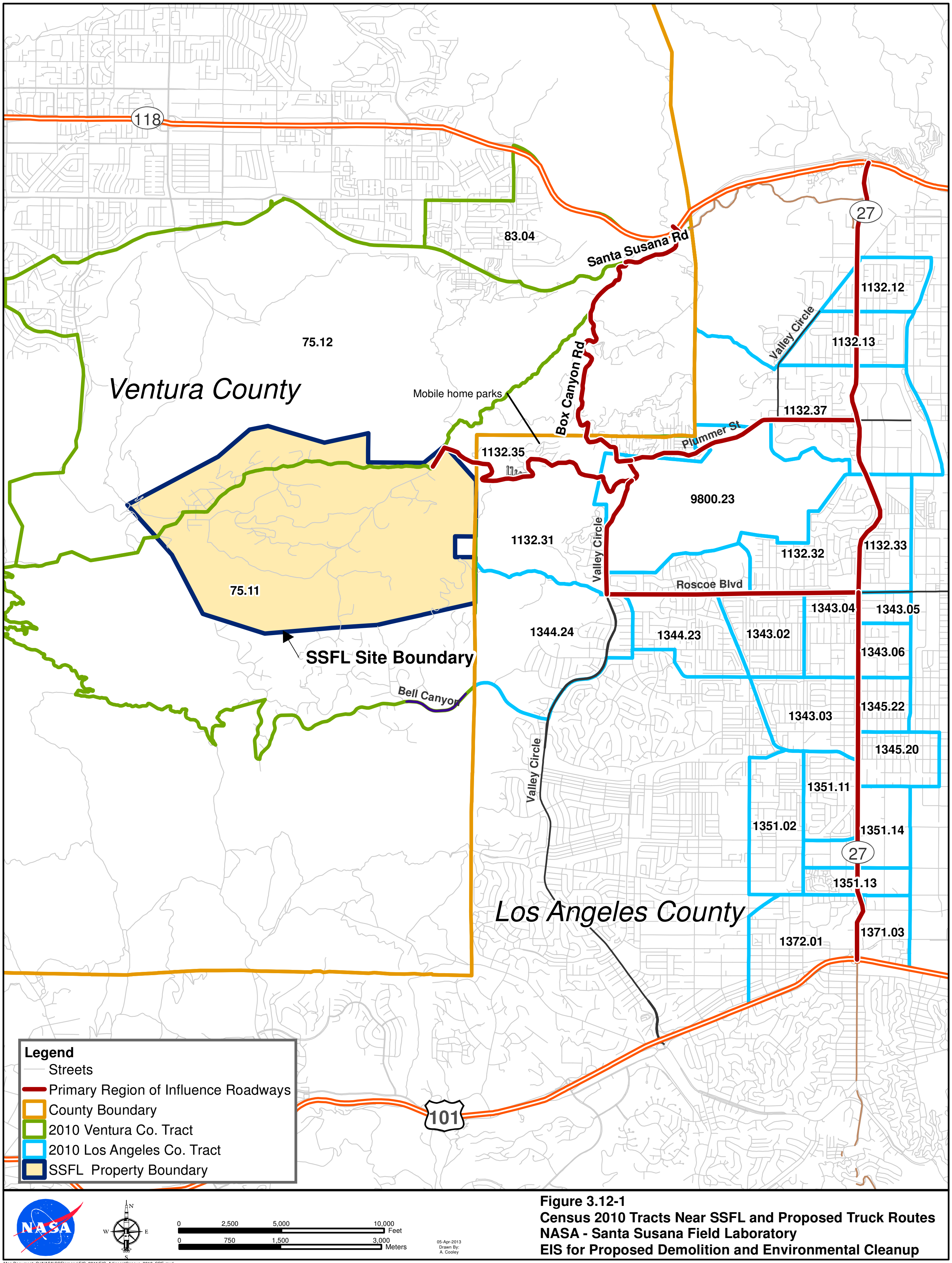


**Figure 3.12-1**
**Census 2010 Tracts Near SSFL and Proposed Truck Routes**
**NASA - Santa Susana Field Laboratory**
**EIS for Proposed Demolition and Environmental Cleanup**

Map Document: O:\NASA\SSFL\maps\EIS_2011\EIS_AdjacentCensus_2010_SDE.mxd

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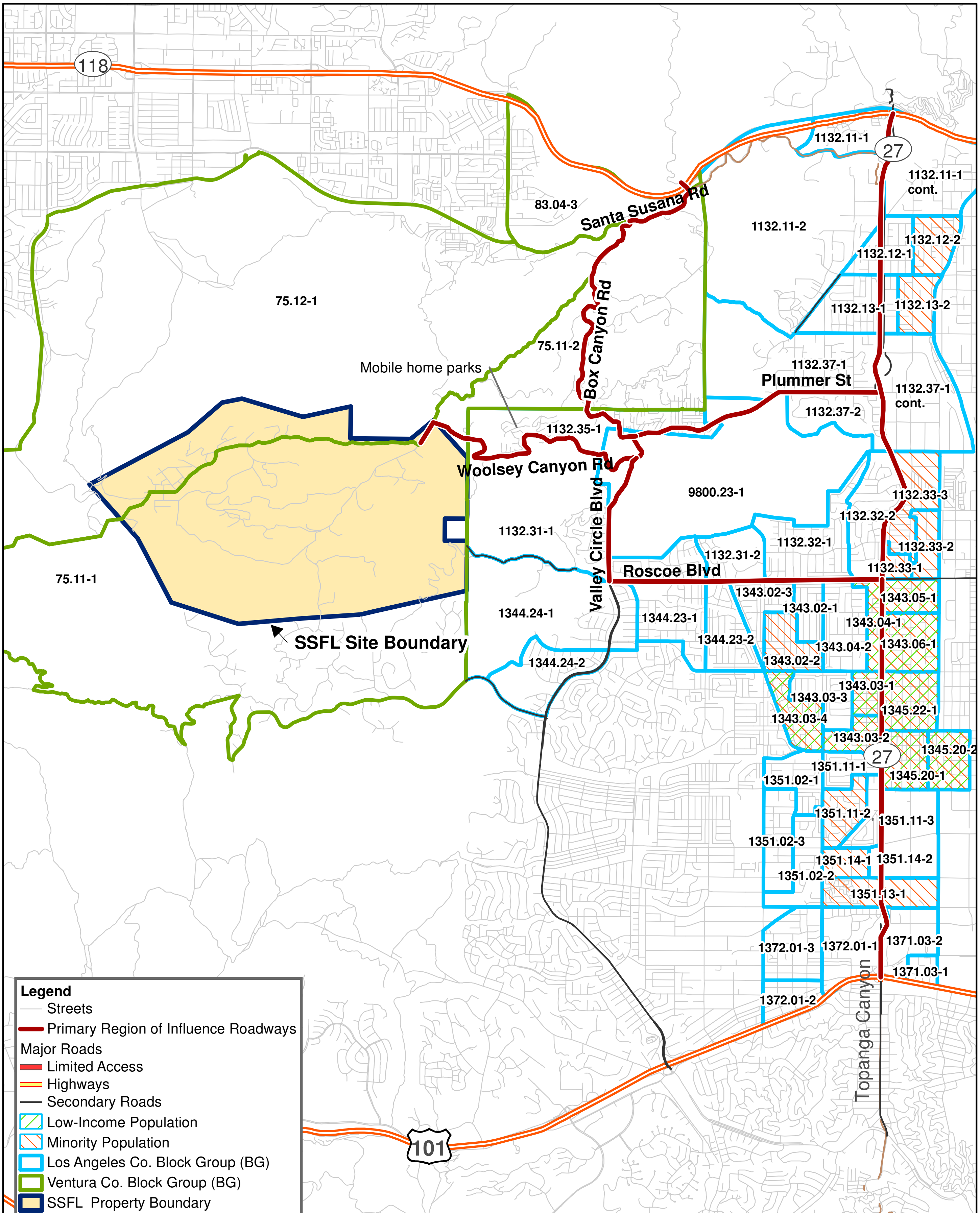


**Figure 3.12-2**
**Census 2010 Block Groups Near SSFL and Proposed Truck Routes**
**NASA - Santa Susana Field Laboratory**
**EIS for Proposed Demolition and Environmental Cleanup**

0 2,500 5,000 10,000 Feet
0 750 1,500 3,000 Meters

10-Apr-2013
Drawn By:
A. Cooley

Map Document: O:\NASA\SSFL\maps\EIS_2011\EIS_AdjacentCensus_BlockGroup_2010_SDE.mxd

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Table 3.12-1 summarizes the resulting minority and low-income data for the ROI and indicates where larger populations of minority and low-income residents are located. For comparison purposes, Table 3.12-1 also provides a similar demographic profile for both Ventura and Los Angeles counties, as well as for the state.

TABLE 3.12-1
**Minority and Low-income Population in Potentially Affected Area**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Location[a] | | Total Population | Minority Population[b] | Poverty Rate[c] |
|---|---|---|---|---|
| **Total Affected Environment (ROI)** | | **93,273** | **52%** | **10.0%** |
| Census Tract 1132.12 Los Angeles County | Block Group 2 | 1,975 | 57% | 0.5% |
| Census Tract 1132.13 Los Angeles County | Block Group 2 | 2,033 | 56% | 11.2% |
| Census Tract 1132.33 Los Angeles County | Block Group 1 | 2,134 | 67% | 12.1% |
| | Block Group 2 | 1,660 | 82% | 9.2% |
| | Block Group 3 | 3,001 | 76% | 6.3% |
| *Census Tract 1132.35 Los Angeles County[d]* | *Block Group 1* | *1,579* | *17%* | *0.0%* |
| Census Tract 1343.02 Los Angeles County | Block Group 2 | 1,489 | 51% | 5.0% |
| Census Tract 1343.03 Los Angeles County | Block Group 1 | 1,161 | 93% | 13.3% |
| | Block Group 2 | 1,173 | 66% | 22.4% |
| | Block Group 4 | 1,375 | 60% | 1.0% |
| Census Tract 1343.04 Los Angeles County | Block Group 1 | 1,076 | 81% | 30.1% |
| Census Tract 1343.05 Los Angeles County | Block Group 1 | 4,341 | 96% | 42.4% |
| Census Tract 1343.06 Los Angeles County | Block Group 1 | 3,752 | 81% | 16.5% |
| Census Tract 1345.20 Los Angeles County | Block Group 1 | 2,753 | 80% | 26.1% |
| | Block Group 2 | 2,354 | 96% | 21.7% |
| Census Tract 1345.22 Los Angeles County | Block Group 1 | 4,255 | 82% | 22.1% |
| Census Tract 1351.11 Los Angeles County | Block Group 2 | 1,467 | 54% | 9.1% |
| Census Tract 1351.14 Los Angeles County | Block Group 1 | 2,694 | 52% | 8.7% |

TABLE 3.12-1
**Minority and Low-income Population in Potentially Affected Area**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Location[a] | | Total Population | Minority Population[b] | Poverty Rate[c] |
|---|---|---|---|---|
| **Total Affected Environment (ROI)** | | **93,273** | **52%** | **10.0%** |
| Census Tract 1351.13 Los Angeles County | Block Group 1 | 2,772 | 64% | 8.0% |
| **Ventura County** | | **835,981** | **51.9%** | **9.9%** |
| **Los Angeles County** | | **9,962,789** | **72.4%** | **16.3%** |
| **California** | | **38,041,430** | **60.3%** | **14.4%** |

Notes:
[a] A total of 49 block groups was evaluated. (Census tract 9800.23 Block Group 1 containing Chatsworth Nature Preserve has no population.) Only the 18 block groups meeting the minimum criteria for minority population are shown in this table. All of the block groups shown here contain truck routes on local roads. None of the eight block groups adjacent to SSFL meet the criteria for either low-income or minority population.
[b] Shading indicates block groups with minority population that is meaningfully greater than in the population of the ROI as a whole.
[c] Shading indicates block groups that also meet the criteria for low-income population. Poverty rate is the percent of the population with income below the poverty threshold (U.S. Census Bureau 2011e). A poverty area has 20 percent of the population below the poverty threshold. An extreme poverty area has 40 percent below the poverty threshold. Darker shading indicates the one block group that is an extreme poverty area (U.S. Census Bureau, 1995, 2011f).
[d] Census tract 1132.35-Block Group 1 contains the Summit and Mountain View Mobile Home Communities (and other conventional housing). Although criteria for low-income or minority population are not met, this block group is included at community request.

Source: U.S. Census Bureau, American Community Survey (ACS), 5-Year Estimates 2007-2011, Table B03002–Hispanic Or Latino Origin By Race and Table C17002–Ratio Of Income To Poverty Level In The Past 12 Months

### 3.12.1.1 Minority Populations

The standard criteria for identifying a minority population is where either (1) the minority population exceeds 50 percent, or (2) the minority population is meaningfully greater than in the general population (CEQ, 1997a, 1997b). The minority population in both Los Angeles and Ventura counties is more than 50 percent and the minority population in the ROI as a whole is 47 percent. In addition, the margin of error for American Community Survey estimates can be substantial. Therefore, it was necessary to look at “meaningfully greater” to account for sampling error and to more accurately identify the potential for disproportionate impacts within the ROI. “Meaningfully greater” was defined as being above the average for the ROI: specifically a block group has a minority population if it exceeds 69 percent minority, which is one standard deviation (22 percentage points) of the average minority population for the ROI as a whole.

Of the 49 census block groups evaluated, 18 block groups met one or both of those criteria (Table 3.12-1). All of those block groups are located in Los Angeles County; none is in Ventura County. In 9 of those 18 block groups, the minority population is meaningfully greater than in the general population of the ROI. The minority population is above 80 percent in eight block groups located adjacent to Topanga Canyon Boulevard.

Demographic data indicate that the block group containing the Summit and Mountain View Mobile Home Communities (and other conventional housing) is 17 percent minority (Table 3.12-1). Of the housing in this block group, 58.3 percent is mobile homes and the remainder consists of conventional single-family houses, with no multi-family housing (U.S. Census Bureau, 2011d).

### 3.12.1.2 Low-income Populations

The Census Bureau uses a set of money income thresholds that vary by family size and composition to establish who is within the poverty level (low-income). If a family's total income is less than the family’s threshold, then that family and every individual in it is considered in poverty. The official poverty thresholds do not vary geographically, but are updated for inflation using Consumer Price Index. The official poverty definition uses money income before taxes and does not include capital gains or noncash benefits (such as public housing, Medicaid, and food stamps). A “poverty area” (low-income population) is where 20 percent or more of the population lives in poverty. An “extreme poverty area” or area of concentrated poverty is where 40 percent lives in poverty (U.S. Census Bureau, 1995; U.S. Census Bureau, 2011).

Of the 15 block groups in the ROI, 6 block groups in Los Angeles County exceeded the 20 percent poverty rate (Table 3.12-1). The block group with the highest poverty rate (42.4 percent) is adjacent to Topanga Canyon Boulevard and south of Roscoe Boulevard on the eastern side of Topanga Canyon Boulevard. None of the block groups in Ventura County exceeded the poverty rate of 20 percent. Three of the block groups in Los Angeles County have poverty rates of 0 percent. Demographic data indicate that the tract and block group containing the Summit and Mountain View Mobile Home Communities (and other housing areas) has a 0 percent poverty rate and a median household income of $73,646.

### 3.12.1.3 Protection of Children

U.S. Census and Los Angeles County Office of Education data were used to assess the potential existing health and safety risks to children. According to the U.S. Census American Community Survey 5-Year Estimates 2007-2011, a total of 2,771 children under the age of 18 live in the block groups adjacent to SSFL. Of these, 506 are younger than 5 years (Table 3.12-2).

A total of 19,010 children under the age of 18, including 6,172 younger than 5 years, live in the block groups containing local roads that would be affected by additional project-related truck traffic (Table 3.12-2). Demographic data indicate that the block group containing the Summit and Mountain View Mobile Home Communities (and other conventional housing) is home to 245 children under the age of 18, including 121 children younger than 5 years.

Figure 3.12-2 shows the location of the block groups referenced by Table 3.12-2. Figure 3.12-3 shows the locations of schools, parks, and open space near SSFL and the proposed truck routes.

TABLE 3.12-2
**Children Residing in Potentially Affected Census Tracts and Block Groups**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Location | | | Children under the Age of 18 | Children under the Age of 5 |
|---|---|---|---|---|
| **Total Affected Environment (ROI)** | | | **21,781** | **6,678** |
| Tracts/Block Groups Adjacent to SSFL | **Subtotal (SSFL area)** | | **2,771** | **506** |
| | Census Tract 75.11 Ventura County | Block Group 1 | 368 | 53 |
| | | Block Group 2 | 20 | 0 |
| | Census Tract 75.12 Ventura County | Block Group 1 | 802 | 226 |
| | | Block Group 2 | 631 | 103 |
| | Census Tract 1132.31 Los Angeles County | Block Group 1 | 287 | 80 |
| | Census Tract 1344.24 Los Angeles County | Block Group 1 | 367 | 44 |
| | | Block Group 2 | 296 | 0 |

TABLE 3.12-2
**Children Residing in Potentially Affected Census Tracts and Block Groups**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Location | | | Children under the Age of 18 | Children under the Age of 5 |
|---|---|---|---|---|
| Tracts/Block Groups Containing Local Roads Affected by Additional Truck Traffic | **Subtotal (Local Roads)** | | **19,010** | **6,172** |
| | Census Tract 83.04 Ventura County | Block Group 3 | 1,084 | 845 |
| | Census Tract 1132.11 Los Angeles County | Block Group 1 | 268 | 36 |
| | | Block Group 2 | 444 | 148 |
| | Census Tract 1132.12 Los Angeles County | Block Group 1 | 497 | 77 |
| | | Block Group 2 | 568 | 215 |
| | Census Tract 1132.13 Los Angeles County | Block Group 1 | 531 | 72 |
| | | Block Group 2 | 409 | 78 |
| | Census Tract 1132.32 Los Angeles County | Block Group 1 | 219 | 35 |
| | | Block Group 2 | 400 | 65 |
| | Census Tract 1132.33 Los Angeles County | Block Group 1 | 699 | 202 |
| | | Block Group 2 | 493 | 82 |
| | | Block Group 3 | 577 | 173 |
| | Census Tract 1132.35 Los Angeles County | Block Group 1 | 245 | 121 |
| | Census Tract 1132.37 Los Angeles County | Block Group 1 | 450 | 135 |
| | | Block Group 2 | 149 | 79 |
| | Census Tract 1343.02 Los Angeles County | Block Group 1 | 28 | 8 |
| | | Block Group 2 | 365 | 104 |
| | | Block Group 3 | 439 | 198 |
| | Census Tract 1343.03 Los Angeles County | Block Group 1 | 469 | 136 |
| | | Block Group 2 | 299 | 52 |
| | | Block Group 3 | 341 | 139 |
| | | Block Group 4 | 236 | 50 |
| | Census Tract 1343.04 Los Angeles County | Block Group 1 | 219 | 102 |
| | | Block Group 2 | 268 | 89 |
| | Census Tract 1343.05 Los Angeles County | Block Group 1 | 1,672 | 433 |
| | Census Tract 1343.06 Los Angeles County | Block Group 1 | 823 | 320 |
| | Census Tract 1344.23 Los Angeles County | Block Group 1 | 297 | 62 |
| | | Block Group 2 | 465 | 116 |

TABLE 3.12-2
**Children Residing in Potentially Affected Census Tracts and Block Groups**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Location | | | Children under the Age of 18 | Children under the Age of 5 |
|---|---|---|---|---|
| | Census Tract 1345.20 Los Angeles County | Block Group 1 | 749 | 362 |
| | | Block Group 2 | 646 | 207 |
| | Census Tract 1345.22 Los Angeles County | Block Group 1 | 1,420 | 191 |
| | Census Tract 1351.11 Los Angeles County | Block Group 1 | 150 | 19 |
| | | Block Group 2 | 239 | 69 |
| | | Block Group 3 | 197 | 82 |
| | Census Tract 1351.13 Los Angeles County | Block Group 1 | 569 | 285 |
| | Census Tract 1351.14 Los Angeles County | Block Group 1 | 456 | 275 |
| | | Block Group 2 | 121 | 54 |
| | Census Tract 1371.03 Los Angeles County | Block Group 1 | 215 | 117 |
| | | Block Group 2 | 175 | 92 |
| | Census Tract 1372.01 Los Angeles County | Block Group 1 | 438 | 167 |
| | | Block Group 2 | 143 | 30 |
| | | Block Group 3 | 538 | 50 |
| Source: American Community Survey (ACS) 5-Year Estimates 2007-2011, Table B01001–SEX BY AGE | | | | |

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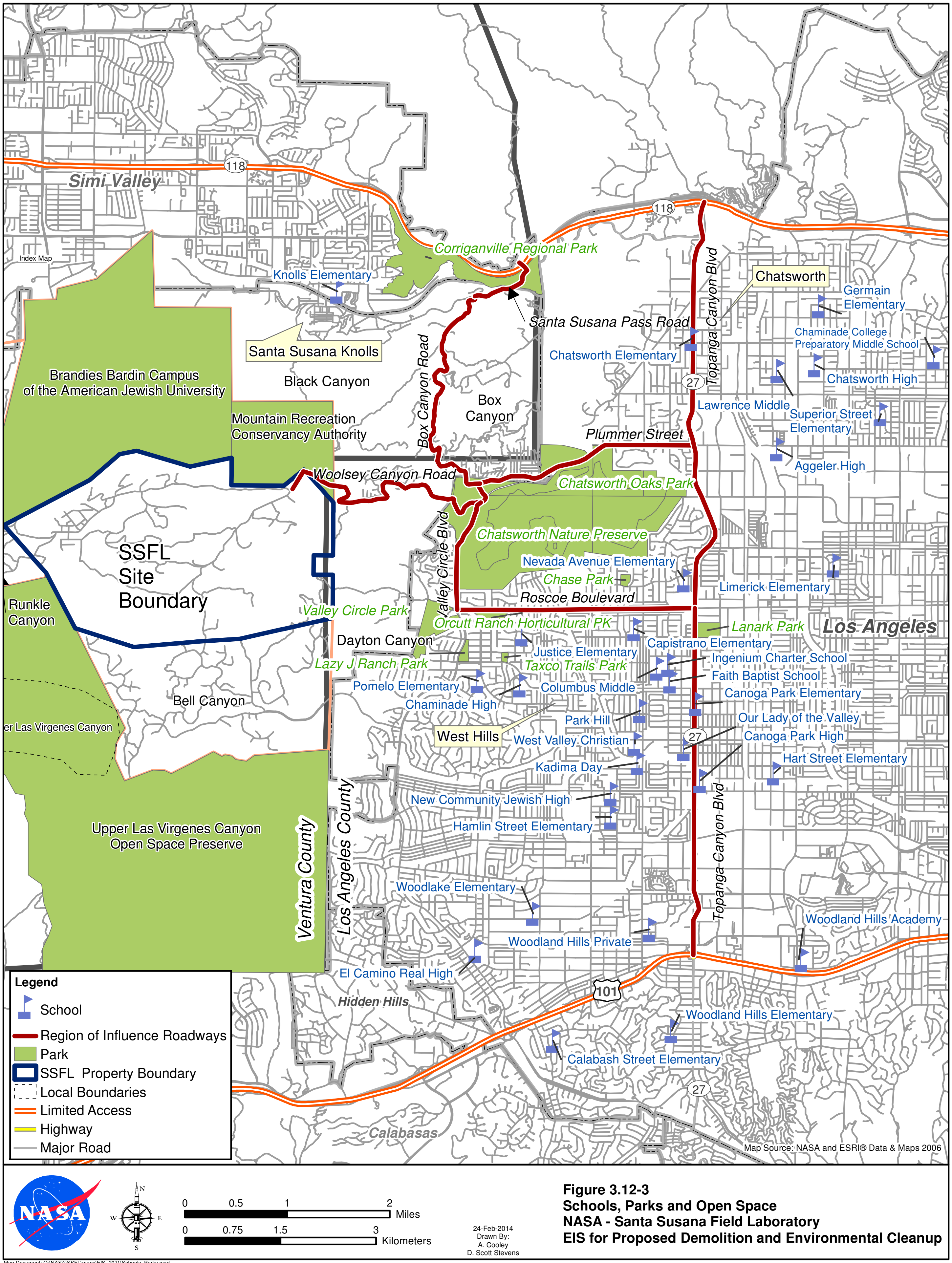


24-Feb-2014
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**Figure 3.12-3**
**Schools, Parks and Open Space**
**NASA - Santa Susana Field Laboratory**
**EIS for Proposed Demolition and Environmental Cleanup**

Map Document: O:\NASA\SSFL\maps\EIS_2011\Schools_Parks.mxd

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SECTION 4

# Environmental Consequences

## 4.1 Introduction

This section addresses the potential environmental impacts from the proposed demolition and environmental cleanup activities on the NASA-administered property at SSFL, as implemented through the following:

- ***Proposed Action***–Demolition, Soil Cleanup to Background Levels, and Groundwater Cleanup (Section 2.2)
- ***No Action Alternative*** (Section 2.3)

The Proposed Action considers implementation of the environmental cleanup action through one or more of the remedial technologies discussed in Sections 2.2.2 and 2.2.3, with up to 100 percent demolition of structures within the NASA-administered property at SSFL.

This report analyzes the potential impacts of the Proposed Action on the resource areas described in Section 3. The National Environmental Policy Act (NEPA) is the legal basis for the analysis of potential environmental impacts to those resource areas. Each subsection of Section 4 describes the methodology used for the impacts analysis specific to each resource area and the factors used to evaluate the significance of the impacts. These are consistent with Council on Environmental Quality (CEQ) Regulations (40 *Code of Federal Regulations* [CFR] 1508.8) and NASA Procedural Requirement 8580.1 (NASA, 2008a) for implementing NEPA. These policies require consideration of "effects" (synonymous with "impacts" in this analysis) that might occur because of the Proposed Action (CEQ, 1978; NASA, 2001). Consistent with these requirements, this analysis identifies likely short- and long-term impacts, as well as direct, indirect, and cumulative impacts on the environment. The Proposed Action could cause direct impacts as a result of the proposed demolition and environmental cleanup activities. The proposed demolition activities are anticipated to begin sometime in 2014 and environmental cleanup activities would follow the demolition activities and are planned to be completed by the end of 2017. The Proposed Action could cause indirect impacts that could occur at a later time or at a different location than the NASA-administered property on SSFL. Cumulative impacts could result from adding the impacts of past, present, and reasonably foreseeable future actions to impacts caused by the proposed demolition and environmental cleanup activities.

### 4.1.1 Section Organization

Sections 4.2 through 4.12 provide resource-focused analyses of the potential environmental impacts. The resource areas are ordered in this section according to their potential impacts from significant to no impact (Section 4.1.3 contains generic impact descriptions). The resource areas that have potential significant impacts are first, while the resource areas that have minor or negligible impacts are evaluated toward the end of Section 4. Those resource areas that potentially would be affected receive detailed consideration in this section. Each subsection discusses the resource-specific region of influence (ROI) and the methodology used in the analysis. The ROI is a specific study area applicable to each resource. For example, the ROI might be the Proposed Action area only, or it might extend beyond the Proposed Action area to include resources outside of the area that could be affected. This is the case for cultural resources where the ROI, called the area of potential effect (APE), extends beyond the Proposed Action area to include sensitive resources in the surrounding area.

Pursuant to NEPA regulations (40 CFR 1500-1508), project effects are evaluated based on the criteria of context and intensity. Context means the affected environment in which a proposed project occurs. Intensity refers to the severity of the effect, which is examined in terms of the type, quality, and sensitivity of the resource involved; location and extent of the effect; duration of the effect (short or long term); and other considerations. Beneficial effects are identified and described. When there is no measurable effect, no impact is found to occur. The intensity of adverse effects is the degree or magnitude of a potential adverse effect, described as negligible, moderate, or substantial. Context and intensity are considered together when determining whether an impact is significant under NEPA. Thus, is it possible that a significant adverse effect might still exist when, on balance, the impact has negligible intensity, or even if the impact is beneficial.

The Proposed Action and the No Action Alternative are analyzed separately. Each analysis considers demolition, implementation of remedial technologies intended to achieve the Look-Up Table values, and operation and monitoring of those technologies, as relevant. Where a relevant distinction of the impacts between the technologies exists, a comparative analysis discusses the potential effects of the various soil and groundwater remediation technologies.

### 4.1.2 Soil Cleanup (Excavation) and Demolition

Of the 500,000 cubic yards ($yd^3$) of contaminated soils, approximately 320,000 $yd^3$, or 64 percent, would have to be excavated and disposed offsite because they are considered non-treatable, as explained in Section 2.2.2. The remaining 180,000 $yd^3$ have the potential to be treated on SSFL using different proposed technologies. However the effectiveness of these technologies would still be evaluated through treatability studies, but their likely impacts to the environment can be discerned for the purposes of this EIS. The majority of the treatable soils lie beneath a 2-foot (ft) layer of soil that has been characterized as non-treatable. The analysis identifies the overall impact of the excavation and offsite disposal of the non-treatable soils and then assesses the incremental impact of the additional remediation technologies for the remaining soil.

Following the analysis, mitigation measures are provided as appropriate to offset negative impacts. An impact summary table is provided at the end of each resource section. Impacts, best management practices (BMPs), and mitigation measures are numbered within the text to correspond to each summary table and clearly connect BMPs or mitigation measures with the related impact. Section 4.13 discusses the cumulative impacts of each of the resource areas discussed, followed by an overall summary table. Section 4.14 summarizes the analyses required by NEPA regarding the relationships among local short-term uses of the environment and long-term productivity and irreversible or irretrievable commitment of resources. Section 4.15 summarizes the required permits, licenses, and approvals for implementing the Proposed Action.

### 4.1.3 Impact Descriptions

To assess whether an impact is significant, the CEQ regulations require consideration of the context and intensity of potential impacts (40 CFR 1508.27). Context refers to the setting–whether local or regional–and intensity refers to the severity and duration of the impact. The methodology section of each resource subsection provides a resource-specific definition of intensity, quality, duration, and location.

The following descriptions generally specify the levels of significance of potential impacts under NEPA (NASA Procedural Requirement 8580.1 [NASA, 2008a]):

| Impact | Description |
|---|---|
| No Impact | No impacts would be expected. |
| Negligible | Impacts would not be expected to be measurable, or would be measurable but too small to cause any change in the environment. |
| Minor | Impacts would be measurable but within the capacity of the affected system to absorb the change. |
| Moderate | Impacts would be measurable but within the capacity of the affected system to absorb the change, and the impacts could be compensated for with mitigation and resources so the impact would not be substantial. |
| Significant | Impacts would be measurable but not within the capacity of the affected system to absorb the change, and without major mitigation, could be severe and long lasting. |
| Quality | Beneficial–would have a positive effect on the physical, social, or cultural environment.<br>Negative–would have an adverse effect on the physical, social, or cultural environment. |
| Proximity | Local–would occur within the NASA-administered property at SSFL.<br>Regional–would occur outside the NASA-administered property at SSFL. |
| Duration: | Short term–would occur only during the proposed demolition and immediate remediation period.<br>Long term–would continue beyond the proposed demolition and immediate remediation period. |

Potential impacts to each resource area are identified by sequential numbers preceded by the resource area name. For example, a potential soil impact due to increased erosion from demolition activities would be cited as ***Soils Impact-1.***

Some sections identify potential or mitigation measures when they might reduce the intensity of an impact. Section 6 of the EIS provides a further mitigation discussion, including a designation of monitoring requirements, responsible parties, success criteria, and timelines.

## 4.2 Soils, Landslide Potential, Topography, and Paleontological Resources

This subsection describes the potential impacts on soils, landslide potential, topography, and paleontological resources within the ROI, defined as the NASA-administered property at SSFL, as a result of implementing the Proposed Action or the No Action Alternative.

Section 4.2.1 includes a summary of the impact analysis to the soils, landslide potential, topography, and paleontological resources under the various soil and groundwater cleanup scenarios. Section 4.2.2 provides information about potential impacts, BMPs, and mitigation measures applicable to site soils, landslide potential, topography, and paleontological resources. Section 4.2.3 provides a discussion of the No Action Alternative. Section 4.2.4 includes a summary table of impacts and corresponding BMPs and mitigation measures identified in the site soils, landslide potential, topography, and paleontological resources analysis. Impacts, BMPs, and mitigation measures are numbered to correspond with the summary table to indicate where impacts might occur and how BMPs and mitigation measures might offset those impacts.

The following descriptions identify thresholds of impacts relevant to the analysis:

| Impact | Description |
|---|---|
| No Impact | No impacts to soils, landslide potential, topography, or paleontological resources would be expected. |
| Negligible | Impacts to soils, landslide potential, topography, and paleontological resources would not be expected to be detectable, would not alter the topography or soils, and would not encounter paleontological resources; or changes would be so small that it would not be of any perceptible consequence. |
| Minor | Impacts to, soils, landslide potential, topography, and paleontological resources would result in little, if any, loss of integrity and would cause a measurable but not visually noticeable change to the topography, or exposure of non-scientifically significant paleontological resources. The change would be small, localized, and of little consequence. |
| Moderate | Impacts to soils, landslide potential, topography, and paleontological resources would result in disturbance to natural physical resource, or soils; visually noticeable but minor changes in topography; or exposure of scientifically significant paleontological resources. |
| Significant | Impacts to soils, landslide potential, topography, and paleontological resources would be measurable and would change natural physical resources, or soils; result in visually noticeable and substantial changes in topography; or would cause damage or destruction of scientifically significant paleontological resources. |
| Quality: | Beneficial–would have a positive effect on soil, geologic, or topographic conditions or on paleontological resources.<br>Negative–would have an adverse effect on soil, geologic, or topographic conditions or on paleontological resources. |
| Proximity: | Local–would occur within the NASA-administered property at SSFL.<br>Regional–would occur outside the NASA-administered property at SSFL. |
| Duration: | Short term–would occur only during the proposed demolition and immediate remediation period.<br>Long term–would continue beyond the proposed demolition and immediate remediation period. |

Studies conducted on the site geology, soils, and paleontology were reviewed to assess the nature of the underlying geology, soils, and fossil potential, as well as historical impacts to geology, soils, paleontological resources and topography, and historical impacts related to seismicity. This review included technical reports, geologic maps, online databases, and seismic hazard maps of the region. The compliance of each alternative with applicable federal and state regulations, as applicable, was assessed to verify whether the impacts of the Proposed Action on soils, topography, or paleontological resources would result in regulatory noncompliance.

The following bullets describe the methodology used to evaluate whether and to what level the Proposed Action would affect soils, landslide potential, topography, and paleontological resources within the affected areas:

- The impact analysis and the conclusions for possible impacts to the topography within the impact areas were based on topographic data for the NASA-administered property at SSFL, previous onsite inspections, and professional judgment.
- The impact analysis and the conclusions for possible impacts to geological resources were based on previous site surveys for known and potential geological resources in the affected areas, published data, and professional judgment. Available information regarding soils potentially affected in various areas of the ROI was compiled through previous soils investigations of the site, as well as the National Resources Conservation Service (NRCS) online database (NRCS, not dated [n.d.]).
- A recent technical memorandum, *Santa Susana Field Laboratory–Paleontological Resources Assessment* (NASA, 2011 [included in Appendix J]) provides an analysis of the potential impacts to paleontological resources, the results of which are summarized in this subsection. Where possible, map locations of geological resources, sensitive soils, seismic hazards, and paleontological resources were compared with the locations of proposed excavations, demolition, and other remediation activities.

## 4.2.1 Proposed Action–Demolition, Soil Cleanup to Background Levels, and Groundwater Cleanup

### 4.2.1.1 Demolition

The NASA facilities to be demolished and associated staging areas are located in disturbed and developed areas. Demolition is expected to take up to 12 to 18 months to complete. Demolition activity likely would involve multiple pieces of construction equipment, typically large in size, and the soils in and around demolition sites would be affected.

Erosion would be the primary soils impact associated with demolition, which would be applicable to all structures to be demolished. Demolition activities likely would increase the rates of erosion temporarily by removing surface vegetation (either intentionally during subsurface excavations, or unintentionally as a consequence of the use of heavy construction equipment), which otherwise would limit soil erosion. Wind erosion could create airborne dust, which could affect worker health and equipment negatively (analyses provided in Sections 4.7 and 4.9). Water erosion could transport soils into local waterways, potentially degrading the quality of these waters (Section 4.6). Where demolition would occur within contaminated soils, wind and water erosion could transport the contaminants offsite (analysis provided in Section 4.7).

Demolition activities would involve excavations to remove basements, foundations, footings, and other subsurface components (including pipelines, utilities, and underground storage tanks) to depths up to 5 ft below grade and might involve the construction or alteration of unpaved access roads. Staging areas would be graded to a level surface. The activities of the heavy equipment would strip the demolition sites and surface vegetation would be removed partially or completely. Disturbed areas would be exposed to wind and water erosion for the duration of the demolition activities, until sufficient ground cover could be established to minimize erosion. The potential for increased erosion during demolition activities would be a potentially ***moderate, negative, regional,*** and ***short-term*** impact ***(Soils Impact-1)***. The impacts would be greatest in the northern portion of the site, which is underlain by sandy and rocky loam (NRCS, n.d.). The southern portion of the site is underlain predominantly by sedimentary rock (NRCS, n.d.), which is less susceptible to erosion. Erosion in areas where hazardous materials might be present, such as maintenance structures, test stands, and laboratory facilities, would be of particular concern, because such erosion could carry contamination offsite.

***Landslide Potential***

Demolition activities might temporarily increase the landslide potential by loosening the sediment around the structures to be demolished. This increase in landslide potential predominantly would be localized to the demolition area itself, and in particular to the sidewalls of any excavations associated with excavation. The increase in landslide potential would be greatest during demolition. After demolition had been completed, the risks posed by landslides would be minimal–demolition would remove buildings from the path of potential landslides and the lack of structures would limit the presence of personnel onsite. Therefore, after demolition had been completed, the risk of landslides would be almost, if not entirely, eliminated, because even if landslides were to occur they would not affect personnel or structures. Therefore, this impact would be ***minor, negative, local,*** and ***short term (Soils Impact-2)*** and could be considered beneficial in the long term**.** The impact to soils from landslides also could affect wildlife and wildlife habitat; these potential impacts are discussed in Section 4.4.

***Topography***

The removal of subsurface components of structures as part of the demolition activities would have a potential to affect the topography within the ROI. The soils in the ROI (and therefore excavations associated with demolition) are shallow, generally extending only 5 ft below ground surface (bgs) and reaching a maximum of approximately 20 ft bgs in isolated areas. Demolition activities would focus on the removal of structural debris rather than geologic material and only would extend to a maximum of 5 ft bgs. In many areas, this material is likely to be fill from previous disturbances. Therefore, impacts to topography from demolition activities would be ***negligible*** to ***minor, negative, local,*** and ***long term (Soils Impact-3)***.

***Paleontology***

Because demolition would affect only previously disturbed sediment and the surrounding soils, ***no impacts*** to paleontological resources would occur during demolition activities ***(Soils Impact-4)***. Fossils found in these sediments would be out of stratigraphic context due to previous soil disturbance associated with construction activities and, therefore, would not be scientifically significant.

### 4.2.1.2 Soil Cleanup to Background

Under the Proposed Action, NASA would remediate the soils at SSFL to meet or be below the Look-Up Table values.

**Excavation and Offsite Disposal**

As with demolition, the greatest potential for negative impacts, regardless of the technology used, would be in the northern portion of the site, which is underlain by material that is less cohesive than the sedimentary rocks of the southern portion of the site (NRCS, n.d.). The primary impact on soils from soil remediation technologies would result from the removal of alluvium, as discussed previously, and increased erosion. Proposed soil cleanup activities could increase erosion in several ways, including removal of ground cover, loosening of soils, temporary stockpiling of soils, increased slopes, grading of stockpiling and staging locations, use of unpaved temporary access roads, onsite excavation and placement of backfill material, and differential compaction from the construction and use of access roads. Because soil and groundwater remediation would occur in areas where soils are contaminated, contamination could spread downwind from loosened soil cover and be washed downgradient during rain events.

The soil remediation areas shown in Figure 2.2-2 include 105 acres or 320,000 $yd^3$, equating to 64 percent, of contaminated soil that must be removed from SSFL because it is considered non-treatable soil and would be disposed offsite. The remaining 180,000 $yd^3$ of treatable soil might need to be excavated if none of the remediation technologies described later in this subsection were found to be effective in meeting the Look-Up Table values, thus resulting in the excavation of 500,000 $yd^3$ of soil.

Excavation and offsite disposal would result in the greatest impacts, because these technologies would disturb the greatest surface areas and expose the removed soil to potential erosion via temporary onsite stockpiling. The removal of soils would be limited to the ROI, while wind and water erosion might carry soil and sediment offsite.

These technologies would result in ***significant, negative, local*** to ***regional,*** and ***short-term*** impacts to soils *(**Soils Impact-5**)*.

Soils stockpiles associated with excavation would be subject to wind and water erosion. The locations of these stockpiles and staging areas would have a large influence on the impacts of these features. For example, stockpiles far from the borders of the ROI would be unlikely to cause sediment to be transported outside the ROI even if the soils were transported by wind and water, while stockpiles close to the borders of the ROI would be much more likely to cause sediment to be transported outside the ROI. Stockpiles and staging areas within slopes and washes would be particularly susceptible to erosion. Therefore, these stockpiles would result in ***minor, negative, local*** to ***regional,*** and ***short-term*** impacts to soils *(**Soils Impact-6**).*

***Landslide Potential***

Although multiple faults exist onsite, they are not known to be active and no significant impacts are known to have occurred from historical seismic events. Little unconsolidated sediment is present in the ROI, and this sediment is not susceptible to liquefaction (State of California, 1998). Therefore, with the exception of landslides (discussed in the following text), ***no impacts*** would be anticipated from seismic events.

Landslide hazards, and in particular rock falls, have been identified as a potential danger in this region (Ventura County Building and Safety, 2011; State of California, 1998). Seismic activity has the potential to generate landslides along the steep slopes within the ROI (State of California, 1998), and because the southern portion of the ROI is more rugged than the northern portion, the greatest potential is in the south of the ROI. The Chatsworth Formation has been shown to be resistant to landslides caused by seismic shaking, although small-scale, localized landslides have occurred in this formation during and after strong seismic events (Parise and Jibson, 2000). The access road to the site also is underlain by the Topanga and Modelo formations, which have a significantly higher potential for landslides during seismic shaking (Parise and Jibson, 2000). Areas where landslides previously have occurred could re-activate if conditions changed, such as increased weight, water content, or slope angle due to project-related activities.

Impacts from seismically induced landslides, limited to rock falls onsite, likely would be localized, because such landslides generally do not extend over large areas (Parise and Jibson, 2000). Landslides also might be triggered in areas of unconsolidated sediment by heavy rain. The rugged portions of the site have little soil cover, so such landslides would be limited to excavations. Activities such as cutting and grading access roads or new staging and stockpiling areas, increased traffic, and increased loads on access roads (due to heavy equipment or trucks) could increase the potential for landslides. Stripping of vegetation could increase the chance of landslides after a heavy rain, as could an activity that decreased soil compaction. However, because landslides do not occur over a wide area, the rugged portions of SSFL have little soil cover, and landslides would be limited to the area near an excavation, the impacts would be ***minor, negative, local,*** and ***short term*** *(**Soils Impact-7**)*. No long-term impacts would be anticipated, because the Proposed Action would remove all structures from the ROI. Should landslides occur after all structures (including those associated with remediation technologies) had been removed, they would be unlikely to cause negative impacts.

***Topography***

Excavation would affect the topography within the ROI. The excavations generally would be shallow; however, they could reach maximum depths of approximately 20 ft bgs in isolated areas. It is planned that excavations would be backfilled, partially by some of the soil disturbed and partially by clean backfill brought to the site. A reasonable effort to restore the topography to pre-construction activities would be made as a BMP, not as a mitigation measure. Therefore, impacts to topography from soil cleanup activities would be ***negligible*** to ***minor, negative, local,*** and ***short term*** *(**Soils Impact-8**)*. This topographical impact analysis presumes that suitable backfill material could be located that would meet the Look-Up Table values for use at SSFL.

***Paleontology***

Paleontological resources most likely would be affected if the Lower Member of the Chatsworth Formation were encountered while excavating. Only deep well excavations that reached the Lower Member of the Chatsworth

Formation would have a moderate potential to affect paleontological resources. In the unlikely event that fossils were encountered, damage to fossils would constitute a significant impact to paleontological resources, because little work has been done on the fossil fauna of this formation. Although no fossils have been found in the Upper Member of the Chatsworth Formation, the depositional setting (near-shore marine fan deposits) is identical to that of the Lower Member. There is little chance of affecting paleontological resources in the Upper Member of the Chatsworth Formation; however, the discovery of paleontological resources in the Upper Member of the Chatsworth Formation would constitute a significant impact, because any fossils found would be scientifically significant. Because of the low likelihood of encountering paleontological resources, impacts to paleontological resources would be expected to be ***negligible, negative, local,*** and ***long term*** *(**Soils Impact-9**)*.

**Excavation and Offsite Disposal with Ex Situ Onsite Treatment**

Approximately 180,000 $yd^3$ of the 500,000 $yd^3$ of contaminated soil have been identified as potentially treatable, as described in Section 2 of this report. Ex situ onsite remedial treatments are being evaluated at this site; potential technology candidates to achieve Look-Up Table values include soil washing, chemical oxidation, land farming, and thermal desorption. Excavation would still represent the most substantial impact to soil within the ROI. Ex situ treatments would result in a reduced or even eliminated impact because soils would be returned to the excavation area. The construction of temporary access roads also could affect topography, because these would have to comply with grade regulations, as well as be passable by the vehicles that need to travel on them. Access road construction could require construction of ramps or cutting into slopes, depending on their location. As part of the excavation activities proposed, where soil is not replaced after ex situ treatment, up to one third of the excavated soil would be replaced with soil obtained from neighboring sites or offsite, if necessary, that did not contain contamination exceeding the Look-Up Table values. Even without soil replacement, excavations would be limited to the removal of soils where the maximum depth of the final excavations would be limited (from less than 5 ft to a maximum depth of approximately 20 ft). Because the topographic relief of the region is more than 1,000 ft, this would be a maximum change of approximately 2 percent, with most excavations being substantially less. Excavations associated with remediation technologies would be a ***significant, negative, local*** to ***regional,*** and ***long-term*** impact to topography *(**Soils Impact-10**)*.

Ex situ technologies remove and process soil before replacing it and could loosen soil and remove groundcover over potentially broad areas, thus increasing the potential for wind and water erosion, which might carry soil and sediments offsite. However, by using BMPs described later in this subsection, the ex situ treated soil would remain onsite and soil would remain in the excavation until vegetative cover could be reestablished. This approach would result in ***minor, negative, local*** to ***regional,*** and ***short-term*** impacts to soils *(**Soils Impact-11**)*.

In evaluating excavation with both offsite disposal and ex situ remedial treatment options holistically, the impact would default to the greater impact. Excavation with offsite disposal would still account for an estimated 64 percent of the soil volume. Additionally, it is anticipated that the surface soil media, including surface soil in areas identified as treatable, would require excavation and offsite disposal due to the complexity of the various contaminants present. Therefore, this remedial option would result in a ***significant, negative, local*** to ***regional*****,** and ***long-term*** impact to the soils media *(**Soils Impact-10**)*.

**Excavation and Offsite Disposal with In Situ Onsite Treatment**

In situ remedial actions also are being evaluated to address the 180,000 $yd^3$ of soil identified as treatable. Intrusive in situ technologies could require the construction and maintenance of access roads and result in the temporary disturbance of ground cover during the construction associated with the remediation technology. Impacts directly related to soil from in situ onsite treatment would be negligible. However, a majority of the soil within the ROI (320,000 $yd^3$) has been identified as being contaminated with non-treatable constituents, or a mix of treatable and non-treatable constituents. Therefore, excavation with offsite disposal still would be required. The impacts to onsite soils at the site would be the same as those described previously under the scenario for excavation and offsite disposal of 500,000 $yd^3$ of soil. This approach would result in ***significant, negative, local,*** and ***short-term*** impacts to soils *(**Soils Impact-12**).*

In situ technologies remediate the soil in-place, and individually would result in minimal surface disturbance. Soil borings, to install temporary monitoring points or temporary delivery and extraction points, would be required to conduct in situ remedies. Various pieces of electrical equipment, such as air blowers or vacuums, would be required near targeted cleanup areas. Most likely, the impacts to the topography within the ROI would be minimal compared to those for excavation or for the ex situ soil treatment options. This approach would result in ***minor, negative, local,*** and ***short-term*** impacts to soils ***(Soils Impact-13)***.

In evaluating excavation with both offsite disposal and in situ remedial treatments options holistically, the impact would default to the greater impact. Excavation with offsite disposal would still account for an estimated 64 percent of the soil volume. Additionally, it is anticipated that the surface soil media, including surface soil in areas identified as treatable, would require excavation and offsite disposal due to the complexity of the various contaminants present. Therefore, this remedial option would result in a ***significant, negative, local,*** and ***short-term*** impact to the soils media ***(Soils Impact-12)***.

### 4.2.1.3 Groundwater Cleanup

Groundwater remedial actions proposed for the site also might affect the soils within the ROI if intrusive activities should be required to conduct the groundwater remedial effort. There would be some soil disturbance during the installation of wells and treatment system infrastructure (pipes, electric conduit, etc.), but the work would be done in discreet locations to minimize the soil disturbance potential. It is assumed that the soil remedial actions likely would occur concurrently with the groundwater remedial actions.

***Landslide Potential and Topography***

Landslide potential and topography impacts have not been identified as a concern during groundwater cleanup, because they pertain to the soil within the ROI. The volume of soil that would be disturbed to prepare for groundwater cleanup activities would not create a measurable impact to the surface conditions within the ROI. Therefore, a designation of ***no impact (Soils Impact-14)*** was assigned to landslide and topography.

***Paleontology***

Of the remediation technologies proposed (Table 2.2-8), only deep well excavations that reach the Lower Member of the Chatsworth Formation would have a measurable impact. Paleontological resources most likely would be affected if the Lower Member of the Chatsworth Formation were encountered while implementing a remedial technology. This action would have a significant or moderate potential to affect paleontological resources. In the unlikely event that fossils should be encountered, damage to fossils would constitute a significant impact to paleontological resources, because little work has been done on the fossil fauna of this formation. Although no fossils have been found in the Upper Member of the Chatsworth Formation, the depositional setting (near-shore marine fan deposits) is identical to that of the Lower Member. There would be little chance of affecting paleontological resources in the Upper Member of the Chatsworth Formation; however, the discovery of any paleontological resources in the Upper Member of the Chatsworth Formation would constitute a significant impact, because any fossils found would be scientifically significant. Because of the low likelihood of encountering paleontological resources, impacts to paleontological resources would be expected to be ***minor, negative, local,*** and ***short term (Soils Impact-15)***.

## 4.2.2 Best Management Practices and Mitigation Measures

This subsection provides brief descriptions of impacts previously discussed, along with corresponding BMPs and mitigation measures. BMPs are defined as actions required by law or an industry standard included in the Proposed Action activities. Mitigation is an action that would benefit the environment, but must be agreed to by agency stakeholders and NASA. Agreed-upon mitigation measures would be provided in an ROD. These impacts, BMPs, and mitigation measures are numbered to correspond to the impact summary table provided in Section 4.2.4.

***Water BMP-1*** (Update and Implementation of a Stormwater Pollution Prevention Plan [SWPPP]) and ***Air Quality Mitigation Measure-3*** (Development of a Dust Control Plan) would provide erosion controls to offset impacts resulting from demolition ***(Soils Impact-1)*** or environmental cleanup activities ***(Soils Impact-5,*** and ***6)***. ***Biology***

***BMP-1*** and ***BMP-2*** would call for revegetation with native plant species and covering of soils exposed during the project. By implementing these measures, the potential impacts from wind and water erosion during both demolition and remediation would be reduced to ***negligible, negative, local,*** and ***short term***.

***Soils BMP-1*:** In general, as a BMP, NASA would use facilities currently in place to minimize the potential impacts of landslides, should they occur. Where new facilities should be required, each site would be evaluated for landslide potential and effective means of mitigating identified landslide potentials would be assessed before construction. New access roads, staging areas, and stockpile areas would follow natural contours and be graded such that cut-and-fill would be minimized. Also, these areas would be sloped and, if necessary, compacted to prevent the possibility of slope failure. Where new roads and other facilities were necessary, they would be located as to avoid areas identified by the State of California (1998) and those areas identified by geologists in field inspections as having the potential for rock falls. Where such avoidance was impossible, appropriate engineering design and construction measures would be incorporated into the project designs to minimize potential damage to project facilities. Access roads periodically would be inspected, particularly after heavy rains or earthquakes. Access roads and staging in steep portions of the site would be avoided, if possible, after heavy rain events, when increased loads could lead to slope failure. The implementation of ***Soils BMP-1*** would reduce the potential ***Soils Impacts-2*** and ***7*** to ***negligible*** to ***minor, negative, local,*** and ***short term***.

### 4.2.3 No Action Alternative

Under the No Action Alternative, no excavation would occur except excavation associated with current onsite activities, so no impacts to topography or paleontological resources would occur due to project-related activities. However, impacts might still occur onsite due to ongoing activities not associated with the Proposed Action. Ongoing activities, including the interim source removal action (ISRA) program, Northern Drainage restoration, sampling, and general maintenance would continue, all of which could affect erosion. These programs would continue to follow their respective program management plans, which include erosion and dust control and soil management BMPs.

Ongoing soil and groundwater remediation, restoration, sampling activities, and off-road vehicle use on the NASA-administered property would have a ***negligible, negative, local,*** and ***short-term*** impact on erosion potential *(**Soils Impacts-5*** and ***6****)*. The potential for landslides to affect the project would remain, because hills and other areas where slopes potentially could fail currently exist onsite; however, no further activities that might exacerbate these hazards would occur. This landslide impact would be considered as ***no impact (Soils Impact-4)***. The buildings and structures currently onsite would not be removed and contamination from these buildings potentially could leach into the soils and groundwater, as discussed in Section 3.7.

### 4.2.4 Summary of Impacts, Best Management Practices, and Mitigation Measures

Table 4.2-1 provides a summary of the impacts on soils, topography, and paleontological resources, as described in this section. Impact and mitigation numbering correspond to Table 4.2-1. The specific mitigation and corresponding impact are provided, followed by a resulting impact level if mitigation is applied successfully. Table 4.2-1 concludes with an overall alternative impact level, based on the highest level of impact identified in the analysis.

TABLE 4.2-1
**Summary of Soils, Landslide Potential, Topography, and Paleontological Resources Impacts, Best Management Practices, and Mitigation Measures**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Impacts[a] | Project Alternatives[a] | | Best Management Practice and Mitigation Measures[a] | Impact after Best Management Practices and Mitigation Measure Implementation[a] |
|---|---|---|---|---|
| | Proposed Action | No Action | | |
| Soils-1: Potential for substantial erosion of top soils during demolition | Moderate, negative, regional, short term ◉ | Negligible, negative, local, and short term ○ | Water BMP-1<br>Air Quality MM-3<br>Biology BMP-1<br>Biology BMP-2 | Negligible, negative, local, and short term ○ |
| Soils-2: Risk landslide potential, subsidence, or expansive soils during demolition | Minor, negative, local, and short term ◉ | Negligible, negative, local, and short term ○ | Soils BMP-1 | Negligible to minor, negative, local, and short term ◉ |
| Soils-3: Effects to topography alteration as a result of demolition | Negligible to minor, negative, local, long term ○ | No impact ▽ | None | N/A |
| Soils-4: Potential damage or destruction of paleontological resources during environmental cleanup | No impact ▽ | No impact ▽ | None | N/A |
| Soils-5: Potential for substantial erosion of soils during excavation | Significant, negative, local to regional, and short term ● | Negligible, negative, local, and short term ○ | Water BMP-1<br>Air Quality MM-3<br>Biology BMP-1<br>Biology BMP-2 | Negligible, negative, local, and short term ○ |
| Soils-6: Potential for substantial erosion of soils during staging and stockpiling | Minor, negative, local to regional, and short term ◉ | Negligible, negative, local, short term ○ | Water BMP-1<br>Air Quality MM-3<br>Biology BMP-1<br>Biology BMP-2 | Negligible, negative, local, and short term ○ |

TABLE 4.2-1
**Summary of Soils, Landslide Potential, Topography, and Paleontological Resources Impacts, Best Management Practices, and Mitigation Measures**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Impacts[a] | Project Alternatives[a] | | Best Management Practice and Mitigation Measures[a] | Impact after Best Management Practices and Mitigation Measure Implementation[a] |
|---|---|---|---|---|
| | Proposed Action | No Action | | |
| Soils-7: Risk landslide potential, subsidence, or expansive soils during environmental cleanup | Minor, negative, local, and short term<br>**○** | Negligible, negative, local, and short term<br>○ | Soils BMP-1 | Negligible to minor, negative, local, and short term<br>**○** |
| Soils-8: Effects to topography alteration as a result of environmental cleanup | Negligible to minor, negative, local, short term<br>○ | No impact<br>▽ | None | N/A |
| Soils-9: Potential damage or destruction of paleontological resources during environmental cleanup | Negligible, negative, local, and long term<br>○ | No impact<br>▽ | None | N/A |
| Soils-10: Effects on soil for excavation and ex situ soil treatment; holistically, impact is driven by excavation parameters | Significant, negative, local to regional, and long term<br>● | Negligible, negative, local, short term<br>○ | Soils BMP-1<br>Water BMP-1<br>Air Quality MM-3<br>Biology BMP-1<br>Biology BMP-2 | Negligible, negative, loca, and long term<br>○ |
| Soils-11: Potential for substantial erosion of stockpiled soils during ex situ treatment activities | Minor, negative, local to regional, and short term<br>**○** | Negligible, negative, local, and short term<br>○ | Water BMP-1<br>Air Quality MM-3 | Negligible, negative, local, and short term<br>○ |
| Soils-12: Effects on soil for excavation and in situ soil treatment; holistically, impact is driven by excavation parameters cleanup | Significant, negative, local, and short term<br>● | Negligible, negative, local, and short term<br>○ | Soils BMP-1<br>Water BMP-1<br>Air Quality MM-3<br>Biology BMP-1<br>Biology BMP-2 | Negligible, negative, local, and short term<br>○ |

TABLE 4.2-1

**Summary of Soils, Landslide Potential, Topography, and Paleontological Resources Impacts, Best Management Practices, and Mitigation Measures**

*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Impacts[a] | Project Alternatives[a] | | Best Management Practice and Mitigation Measures[a] | Impact after Best Management Practices and Mitigation Measure Implementation[a] |
|---|---|---|---|---|
| | Proposed Action | No Action | | |
| Soils 13: Potential impact to soils during in situ remedial actions | Minor, negative, local, and short term ◉ | Negligible, negative, local, and short term ○ | None | N/A |
| Soils-14: Landslide potential and changes to topography during groundwater cleanup | No impact ▽ | No impact ▽ | None | N/A |
| Soils 15: Potential impact to paleontological resources during groundwater remedial actions | Minor, negative, local, and short term ◉ | Negligible, negative, local, and short term ○ | None | N/A |
| **Overall Alternative Impact** | Significant, negative, regional, and long term ● | Negligible, negative, local, and short term ○ | Soils BMP-1<br>Water BMP-1<br>Air Quality MM-3<br>Biology BMP-1<br>Biology BMP-2 | Negligible to minor, negative, local, and long term ◉ |

Notes:

● or ■ = Significant

◉ or ◘ = Moderate

◉ or ◘ = Minor

○ or □ = Negligible

▽ = No impact

Circular symbols represent negative impacts while square symbols represent beneficial impacts, and the degree to which the symbol is filled represents the severity of the impact.

BMP = best management practice

MM = mitigation measure

[a] Potential impacts, BMPs, and mitigation measures are discussed further in Sections 4.2.1 through 4.2.3.

# 4.3 Cultural Resources

This subsection describes the potential impacts on cultural resources, including sacred sites and historic properties (National Register of Historic Places [NRHP]-listed or –eligible archeological sites, historic structures, Traditional Cultural Properties [TCPs]), within the APE, which could result from implementation of the Proposed Action or the No Action Alternative. The APE (or ROI) (Figure 3.3-1) is defined as the NASA-administered property at SSFL, as well as additional areas extending beyond the NASA boundary that might be affected by proposed environmental cleanup activities (shown in Figure 2.2-2).

Section 4.3.1 includes a summary of the impact analysis to the cultural resources under the various soil and groundwater cleanup scenarios. Section 4.3.2 provides information about potential impacts and BMPs/mitigation measures applicable to site cultural resources. Section 4.3.3 provides a discussion of the No Action Alternative. Section 4.3.4 includes a summary table of impacts and corresponding BMPs and mitigation measures identified in the site cultural resources analysis. Impacts, BMPs, and mitigation measures are numbered to correspond with the summary table to indicate where impacts might occur and how BMPs and mitigation measures might offset those impacts.

Pursuant to Section 106 of the National Historic Preservation Act (NHPA), NASA must assess the effects of a proposed undertaking on historic properties. If the agency finds that historic properties might be affected by the proposed action, the agency must then examine those effects to evaluate if the project could have an adverse effect on historic properties. Under Section 106, findings of effect include “no historic properties affected” when an agency finds that either there are no historic properties present or that the undertaking would not impact a historic property. A finding of “no adverse effect” indicates that an undertaking would impact a historic property, but would not alter the defining characteristics of the historic property or an undertaking is modified or conditions are imposed to avoid an adverse effect. “Adverse effect” is found when an undertaking may alter directly or indirectly a historic property’s defining characteristics in a manner that would diminish the integrity of the property’s location, design, setting, materials, workmanship, feeling or association (36 CFR 800.5(a)(1)). Adverse effects include reasonably foreseeable effects caused by the undertaking that could occur later in time, be farther removed in distance, or be cumulative. Following are examples of adverse effects:

- Physical destruction or damage
- Alteration inconsistent with the Secretary of the Interior's Standards for the Treatment of Historic Properties
- Relocation of the property
- Change in the character of the property's use or setting
- Introduction of incompatible visual, atmospheric, or audible elements
- Neglect and deterioration
- Transfer, lease, or sale out of federal control without adequate preservation restrictions

One of the mandates of NEPA is to “preserve important historic, cultural, and natural aspects of our national heritage” (Sec. 101 [42 United States Code § 4331]). According to NEPA regulations, in considering whether an action might "significantly affect the quality of the human environment," the agency must consider the following:

- Unique characteristics of the geographic area such as proximity to historic or cultural resources (40 CFR 1508.27(b)(3))
- The degree to which the action might adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the NRHP (40 CFR 1508.27(b)(8))

For this project, the NEPA process is being used in lieu of the NHPA Section 106 consultation process, in accordance with 36 CFR 800.8(c). NASA has notified the State Historic Preservation Officer (SHPO), the Advisory Council on Historic Preservation (ACHP), Native Americans, and consulting parties of this process, in accordance with the regulations. The substitution of NEPA for Section 106 does not exempt the federal agency from its responsibility to resolve adverse effects through consultation under Section 106. Section 5.4.1 provides an overview of the consultation process currently underway in compliance with Section 106 of the NHPA. This process includes consultation with the SHPO, the ACHP, the Santa Ynez Band of Chumash Indians, Native

American individuals, and other Section 106 consulting parties. The effects analysis and findings presented in this EIS have not yet received comment or concurrence from SHPO.

It should be noted that the 2010 Administrative Order on Consent for Remedial Action (AOC) (State of California DTSC Docket No. HAS-CO_10/11-038, 2010) allows for consideration of exceptions subject to the Department of Toxic Substances Control's (DTSC's) oversight and approval that aim to achieve as close a cleanup to background as practicable. An exception provided in the 2010 AOC is "Native Artifacts that are formally recognized as Cultural Resources" (Cal/EPA, DTSC, 2010). NASA will work closely with DTSC to identify if any of the impacts to Native American cultural resources can be minimized under this exception.

The threshold for measuring the intensity of impacts on cultural resources is based on 36 CFR 800.5, as described previously; on Executive Order (EO) 13007; and on NEPA. Per EO 13007, agencies managing federal lands shall "avoid adversely affecting the physical integrity of such sacred sites." The impacts analysis considers the impacts of the Proposed Action and No Action Alternative on the physical integrity of the designated Indian Sacred Site. Per NEPA, impacts are analyzed based on quality, proximity, and duration.

The following descriptions identify thresholds of impacts relevant to cultural resources, and also lists the correlation between NEPA impacts and NHPA Section 106 effects:

| Impact | Description |
|---|---|
| No Impact | No impacts on cultural resources would be expected. This would be analogous to a determination of ***no historic properties affected*** under Section 106 of the NHPA. |
| Negligible | Impacts on cultural resources would not be expected to be detectable and would not alter resource conditions, such as site preservation, or the relationship between the resource and the affiliated group's body of practices or beliefs. This is analogous to a determination of ***no historic properties affected*** under Section 106 of the NHPA. |
| Minor | Impacts on cultural resources would result in little, if any, loss of integrity and would be slight but noticeable. Impacts would not appreciably alter resource conditions or the relationship between the resource and the affiliated group's body of practices or beliefs. This is analogous to a determination of ***no adverse effect*** under Section 106 of the NHPA. |
| Moderate | Impacts on cultural resources would result in disturbance to a site, loss of integrity, and/or alteration of resource conditions. Impact would appreciably alter resource conditions and/or the relationship between the resource and the affiliated group's body of practices or beliefs. This is analogous to a determination of ***adverse effect*** under Section 106 of the NHPA. Measures to minimize or mitigate adverse effects would be decided through consultation to reduce the intensity of impacts to a level less than significant. |
| Significant | Impacts on cultural resources would result in disturbance to a site, loss of integrity, and/or alteration of resource conditions. Impacts would appreciably alter resource conditions and/or the relationship between the resource and the affiliated group's body of practices or beliefs. This is analogous to a determination of ***adverse effect*** under Section 106 of the NHPA. Measures to mitigate adverse effects would be decided through consultation, but mitigation would not be sufficient to reduce the intensity of impacts to a level less than significant under NEPA. |
| Quality | Beneficial–would have a positive effect on historic properties or the cultural environment.<br>Negative–would have a negative effect on historic properties or the cultural environment. |
| Proximity | Local–would occur within the APE.<br>Regional–would occur outside the APE. |
| Duration: | Short term–would occur only during the proposed demolition and immediate remediation period.<br>Long term–would continue beyond the proposed demolition and immediate remediation period. |

An agreement document is being prepared as the document incorporating NASA's binding commitments to measures to avoid, minimize, or mitigate adverse effects in accordance with 36 CFR 800.8(c)(4)(i)(A). Consultation with SHPO, ACHP, Native Americans, and other consulting parties regarding appropriate mitigation measures to address the adverse effect on cultural resources, is ongoing. The agreement document formalizing the agreement among the parties will be a part of the ROD. If the agreement document is signed and executed prior to completion of the Final EIS (FEIS), it will be attached to the FEIS. If the agreement document is not executed prior to completion of the FEIS, it will be included in the ROD.

This subsection provides an analysis of impacts to cultural resources from the proposed demolitions and a comparative analysis of impacts related to soil remediation technologies, followed by the same for groundwater remediation technologies. Potential impacts to cultural resources from the Proposed Action would include, but would not be limited to, demolition of historic structures; alterations to historic districts; changes to the viewshed from the removal of structures and vegetation; alterations to the setting, feeling, and association of a property; removal of or damage to historic archeological sites; or physical changes to significant characteristics of a sacred site. In this subsection, the terms historic structures, historic buildings, and historic archeological resources refer to historic properties that are listed in or eligible for listing in the NRHP.

The stockpiling and staging areas would be located in areas previously affected by ground-disturbing activity (the sites of existing roads or parking lots, for example) to avoid or minimize impacts to historic archeological resources. There would be no additional impacts from staging and stockpiling activities.

Impacts to each cultural resource type are analyzed for each of the parts of the Proposed Action: demolition, soil cleanup to background (including ex situ and in situ remediation technologies), and groundwater cleanup. The impact findings are presented by cultural resource type, so there are separate findings for the Indian Sacred Site and TCP, for archeological resources, and for architectural resources. For each of these, there is an impacts finding under NEPA and a finding of effect under Section 106. Finally, in Table 4.3-1 (at the end of this subsection), there is a single overall impact finding for cultural resources from the Proposed Action.

## 4.3.1 Proposed Action–Demolition, Soil Cleanup to Background Levels, and Groundwater Cleanup

### 4.3.1.1 Demolition

This subsection discusses the potential impacts of the demolition of structures within the APE. The analysis of impacts from proposed demolition activities considers the removal of up to 100 percent of the structures on the NASA-administered property, including 55 structures within the boundaries of the 3 historic districts. It should be noted that even if demolition were not necessary to meet Look-Up Table values, removal of a structure might occur as NASA prepares the site for disposition.

**Indian Sacred Site**

The proposed demolition of 20th century buildings and structures likely would not negatively impact the Indian Sacred Site. The demolition and removal of recent industrial buildings and infrastructure that change the viewshed and natural appearance of the Sacred Site would provide a long-term benefit to the site. The impact on the Indian Sacred Site with respect to building, structure, and infrastructure demolition activities would be ***negligible, beneficial, regional,*** and ***long term*** under NEPA and ***no adverse effect*** under Section 106 ***(Cultural Impact-1a).***

**Traditional Cultural Property**

The proposed demolition of 20th century industrial buildings and structures likely would not negatively impact the identified TCP. The demolition and removal of recent buildings and infrastructure that changed the viewshed and natural setting of the TCP would provide a long-term benefit to the site. The impact on the TCP with respect to building, structure, and infrastructure demolition activities would be ***negligible, beneficial, regional,*** and ***long term*** under NEPA and ***no adverse effect*** under Section 106 ***(Cultural Impact-1a).***

**Archeological Resources**

The proposed demolition of buildings and structures likely would have a minimal impact on known NRHP-eligible or -listed archeological resources in the APE. None of the proposed building demolitions are within the footprint of historic archeological resources. The majority of structures and buildings slated for demolition are in areas where the ground was graded and altered to accommodate the construction of the buildings in the 1950s and 1960s, prior to passage of the NHPA, meaning that possible deposits would have been disrupted already. Ancillary structures slated for demolition include building foundations, piping, aboveground and belowground storage tanks, lookouts, roadways, and drainageways. In most of these cases, the ground would have been disturbed to construct or place the tanks, roads, or drainage features. No structures or ancillary structures would be removed from Archeological Sites 1 and 2. There would be no impacts to these two historic properties from demolition activities. Some of the ancillary structures, such as above ground piping, might be located in the Burro Flats area and might need to be removed. The removal of ancillary structures could impact Burro Flats, but because it would be in the vicinity of a previous disturbance, the impacts would be ***minor, negative, local***, and ***long term*** and a finding of ***no adverse effec*****t** under Section 106 *(**Cultural Impact-1b**).*

Demolition would include the removal of buildings up to 5 ft below grade. Additionally, some ancillary structures are below ground and would require some excavation for removal. Although these areas previously have been disturbed, there is still some potential to encounter unknown archeological deposits during removal of concrete foundations and belowground structures. The potential impact on unknown archeological resources would be ***minor, negative, local,*** and ***long term*** under NEPA and ***no adverse effect*** under Section 106 *(**Cultural Impact-1b**)*.

**Architectural Resources**

The Alfa, Bravo, and Coca Test Area Historic Districts compose 55 structures in total, of which 36 are NRHP-eligible as resources that contribute to the significance of the historic district. Of the 36 contributing resources, 9 are also individually eligible for listing in the NRHP:

- Alfa Test Area Historic District–18 buildings and structures; 10 contributing resources, of which 3 are also individually NRHP-eligible
- Bravo Test Area Historic District–10 buildings and structures; eight contributing resources, of which 3 are also individually NRHP-eligible
- Coca Test Area Historic District–27 buildings structures; 18 contributing resources, of which 3 are also individually NRHP-eligible

Physical destruction of a historic property eliminates the property and completely removes all evidence of its significance, thereby causing an adverse and significant impact. The impact of the demolition of all or the majority of the contributing resources in any or all of the historic districts would result in the loss of integrity of the individual historic districts, thereby making them ineligible for listing in the NRHP, which would be a significant, adverse effect on historic properties. The demolition of all of the contributing resources in the Alfa, Bravo, and Coca Test Area Historic Districts (listed in Table 3.3-2) would result in the district no longer existing, which would be a ***significant, negative, regional,*** and ***long-term*** impact to cultural resources under NEPA and would result in ***adverse effects*** on each of these historic districts under Section 106 *(**Cultural Impact-1c**).*

The demolition of individually NRHP-eligible structures would result in an ***adverse effect*** on each of these historic properties under Section 106 for the reasons stated previously and would have a ***significant, negative, regional,*** and ***long-term*** impact to cultural resources under NEPA *(**Cultural Impact-1c**)*. Any decision to save one or two individually NRHP-eligible properties would result in no adverse effect to that individual historic property, but the impact still likely would result in the loss of integrity of the surrounding historic district and thus result in an ***adverse effect*** to the historic district and a ***no adverse effect*** for an individually eligible property that was not demolished.

Demolition of noncontributing structures within the three districts would affect the setting and feeling of the districts by changing their surroundings. However, the removal of noncontributing structures would not diminish the integrity or the character-defining features of the district and would be considered a ***minor, negative, local,*** and ***long-term*** impact to the district under NEPA and a ***no adverse effect*** under Section 106 to each district *(**Cultural Impact-1d**).*

No historic structures are located outside of the three historic districts. Demolition occurring outside the boundaries of the districts could affect the districts due to changes to the broader setting of the districts, but would not have an adverse effect on the historic districts or individually eligible properties, because they would retain their character-defining features. Demolition occurring outside the boundaries of the historic districts would have a ***minor, negative, local,*** and ***long-term*** impact on the historic districts under NEPA and would have a finding of ***no adverse effect*** under Section 106 *(**Cultural Impact-1d**)*.

The overall effect on cultural resources from the Proposed Action demolitions would be ***significant, negative, regional,*** *and* ***long term*** under NEPA and would be an ***adverse effect*** under Section 106. Soil Cleanup to Background

#### 4.3.1.2 Soil Cleanup to Background

For the purposes of the cultural resources impact analysis, this subsection discusses the potential effects of the soil remedial activities on identified historic properties (NRHP-listed or –eligible archeological sites, historic structures, TCPs) and sacred sites within the APE. In sequencing the demolition and cleanup activities for efficient management of the project, the majority of building demolitions would occur ahead of the related soil and groundwater cleanup activities. Figure 2.2-2 shows the footprint of the proposed remediation areas under the Proposed Action. The total area of the remediation footprint is approximately 105 acres and includes approximately 500,000 $yd^3$ of contaminated soil.

Although Section 4.3.1.1 provides a discussion of impacts from up to 100 percent demolition of structures, it is possible some structures would not be demolished. As such, this subsection also provides a discussion of potential impacts to historic structures from soil cleanup activities. Under the Proposed Action, NASA would remediate the soils within the impact area footprint. Cleaning up the soils to background would require the removal of soils contaminated at concentrations above the local background levels. Soils would be sampled and characterized before transport to confirm soil content and to identify the appropriate handling and disposal facility. The depth of soil requiring cleanup would be at least 2 ft, but could go as much as 20 ft below the surface. One of the remedial technologies includes backfill of clean soil into the excavated areas. The quantity of backfill used would be dependent on the availability of clean soil. If clean soil is not available, the site could be left as is after excavation activities are complete and no backfill would be used. The impacts to cultural resources identified in this section would not change based on whether backfill is used or not.

Implementation and operation of remedial technologies would affect historic properties within the APE to varying degrees, depending on the location of the treatment and the level of ground disturbance from the remedial technology. Each cleanup technology in the following subsections includes a discussion of potential impacts to cultural resources from each remedial technology. Within the APE, there would be a low to moderate potential of encountering buried archeological deposits outside the boundaries of the significant archeological sites during ground-disturbing activities. This finding is based on the lack of soils and deposition that would support buried resources within the APE, the level of modern disturbance throughout the site, and previous redeposits of artificial fill (MWH, 2007c; NASA, 2011e [Appendix J]).

**Excavation and Offsite Disposal**

The soil remediation areas shown in Figure 2.2-2 include approximately 105 acres. The maximum extent of soil removal (all contaminated soil removed) would be approximately 500,000 $yd^3$of soil. If a combination of excavation and offsite disposal of non-treatable soil and other remedial technologies was used, approximately 320,000 $yd^3$, or 64 percent, of contaminated soil would be removed from SSFL and disposed offsite. Stratification (or ***layering****)* of the contamination could require that the majority of areas identified in Figure 2.2-2 would have the top 2 ft of non-treatable soil excavated, removed, and disposed offsite (refer to Section 2.2). The remaining approximately 180,000 $yd^3$ of contaminated soil (36 percent of the total contaminated soil) would be treatable but might need to be excavated if none of the remediation technologies described hereafter was found to be effective in meeting the Look-Up Table values, either due to time constraints or the feasibility of the technology. It is possible that up to 100 percent of the treatable contaminated soil would then have to be remediated using excavation and offsite disposal.

***Indian Sacred Site and Traditional Cultural Property***

Per discussions with the Santa Ynez Band of Chumash Indians, this analysis assumes that the entire APE is included in the Indian Sacred Site designation. For the purpose of this analysis, the TCP also encompasses the entire APE, so the impacts would be similar and are discussed together in this subsection. The excavation and removal of 320,000 $yd^3$ of soil would affect the physical integrity of the Indian Sacred Site and TCP by altering the landscape through plant and soil removal. Because only one third of the removed soil would be replaced, the character of the Indian Sacred Site would be altered permanently. There would also be temporary visual impacts to the Indian Sacred Site and the TCP during the equipment and excavation activities.

The impact on the Indian Sacred Site and TCP from excavation and soil removal of 320,000 $yd^3$or greater of soil would be ***significant, negative, regional,*** and ***long term*** and would constitute an ***adverse effect*** under Section 106 ***(Cultural Impact-2a),*** because it would alter the sense of place and the landscape, including plants and habitat**.**

The Proposed Action would change the current topography by removing at least 320,000 $yd^3$ of soil and would replace the contaminated soil with soil brought in from other locations. Minimizing the volume of excavation would reduce the overall impact on the Indian Sacred Site and TCP. However, consultation with the Santa Ynez Band of Chumash Indians and DTSC would be required to identify the extent to which effective cleanup could be achieved through excavation, while also avoiding or minimizing adverse impacts to the physical integrity of the Indian Sacred Site and TCP.

***Archeological Resources***

The location of the Burro Flats site is confidential and not disclosed in this report. It has been estimated that roughly 0.65 acre of the Burro Flats site would be impacted by soil excavation and offsite disposal of the soil as part of the cleanup activities. None of the identified features of the Burro Flats site would be impacted by the cleanup activities. The contaminated soil is not located within the boundary of the Burro Flats site, but rather in the buffer area around the site, which for the purposes of this analysis is considered part of the historic property. However, field sampling within the Burro Flats site (including the buffer area) to delineate the exact locations of the contaminated soil has not yet been completed. The disturbance from the soil excavation and removal of the soil to another location could impact the Burro Flats site. Previously undiscovered archeological resources could be damaged or removed from the site because of the excavation and offsite removal. The impacts to the Burro Flats site from the excavation and removal of soil within the property boundaries would be ***significant, negative, regional,*** and ***long-term*** and would constitute an ***adverse effect*** under Section 106 ***(Cultural Impact-2a).*** The proposed soil cleanup activities also potentially would impact a small portion of Archeological Site 2. Impacts to this site from soil excavation and removal could result in ***moderate, negative, local,*** and ***long-term impacts*** under NEPA. A determination of eligibility of this site, in consultation with the SHPO and the federally recognized tribes, would be completed before cleanup began, if this site were to be affected by soil cleanup activities. Archeological Site 1 would not be affected by excavation and removal of soil because it is not located within the identified cleanup areas.

Avoidance of excavation within the boundaries of Burro Flats and Archeological Site 2 would diminish or eliminate adverse impacts to known archeological sites and reduce the impacts to ***negligible, negative, local,*** and ***long term*** and could result in a finding of ***no adverse effect*** under Section 106.

During soil excavation, it could be possible that previously undiscovered archeological sites would be affected by soil excavation and disposal. The soil could contain previously unidentified archeological resources that would be impacted by the excavation of the soil and removal to another location. Impacts on previously undiscovered archeological sites found to be NRHP-eligible from excavation activities could be ***significant, negative, local,*** and ***long-term***, thus resulting in a finding of ***adverse effect*** under Section 106 ***(Cultural Impact-2a)***. Reducing the amount of excavation on newly discovered archeological deposits (commonly referred to as “inadvertent or accidental discoveries”) could minimize the impact if the newly identified sites were avoided, thus reducing the impacts to ***minor, negative, local,*** and ***long-term*** impacts from excavation.

***Architectural Resources***

Because remediation areas in some cases are located under existing structures, this technology would require historic structures located in remediation areas to be removed, where necessary, to reach contaminated soils. The Alfa, Bravo, and Coca Test Area Historic Districts have remediation areas that correspond to the locations of contributing or individually eligible structures. The removal of contributing or individually eligible structures within historic districts to excavate and remove soil would result in ***significant, negative, regional,*** and ***long-term*** impacts on cultural resources under NEPA and a finding of ***adverse effect*** under Section 106 *(**Cultural Impact-2a**)*. There would be no impacts to the significant architectural resources from soil remediation activities outside the boundaries of the historic districts.

**Excavation and Offsite Disposal with Ex Situ Onsite Treatment**

The ex situ soil remediation technologies would be used only after the 320,000 $yd^3$ or more of non-treatable soil had been excavated and removed. These technologies would be used to remediate the remaining 180,000 $yd^3$ of treatable soil. This analysis evaluates the overall impacts to cultural resources from the excavation and offsite disposal described previously, together with the additional impacts from the ex situ remediation technologies.

The ex situ remedial technologies would have similar impacts to cultural resources. They all involve excavation of soil and its relocation to treatment areas. The depth of excavation would depend on the depth of contamination at each site, but could be to a depth of up to 20 ft. Thermal desorption would require excavation of the soil and removal to an onsite treatment area where the soil would be treated with a heat source. Once cooled, after treatment, the soil could be returned to the site from which it was excavated. Soil washing would remove the soil and treat it through the physical separation of the fine- and coarse-grained particles to minimize the amount of contaminated material. The chemical oxidation remedial technology would excavate and remove soils to a treatment area where the soil would be mixed with oxidants or reducing agents, then ultimately backfilled to the excavation site. The land farming technology would entail excavating and hauling soil to a designated onsite area. The soil would be placed in the treatment area and nutrients and moisture would be added to stimulate biodegradation of the organic constituents. Once the levels of contamination met criteria, the soil could be backfilled to the excavation area. The quantity of backfill used would be dependent on the availability of clean soil. If clean soil is not available, the site could be left as is after excavation and no backfill used. The impacts to cultural resources identified in this section would not change based on whether backfill is used or not.

***Indian Sacred Site***

The ex situ soil remediation technologies on the 180,000 $yd^3$ of treatable soil would require the removal of the contaminated soil to an onsite location for treatment. After treatment, the treated soil would be returned to the locations where it had been removed. However, the excavation site would not be returned to its previous state as a Sacred Site, along with the pre-existing topography and vegetation features. During the various ex situ treatments, there would be additional temporary visual impacts to the Sacred Site from the equipment used and materials needed to carry out the treatment. If this technology should be deployed for cleanup of treatable soils, it would have a ***significant, negative, regional,*** and ***long-term*** impact on the Sacred Site and an ***adverse effect*** under Section 106 due to the changes it would cause to the landscape.

The incremental impacts on the Indian Sacred Site from excavation and removal offsite of non-treatable soil (320,000 $yd^3$) and the ex situ remediation of treatable soil (180,000 $yd^3$) would be ***significant, negative, regional,*** and ***long term*** and an ***adverse effect*** under Section 106, because the action would alter the physical characteristics of the sacred site *(**Cultural Impact-2a**)*.

***Traditional Cultural Property***

The ex situ soil remediation technologies on the 180,000 $yd^3$ of treatable soil would require the removal of the contaminated soil to an onsite location for treatment. After treatment, the treated soil would be returned to the locations where it had been removed. However, the excavation site would not be returned to its previous state, or with its pre-existing topography and vegetation features. During the various ex situ treatments, there would be temporary visual impacts to the TCP from the equipment used and materials needed to carry out the treatment. If this technology should be deployed for cleanup of treatable soils within the boundaries of the TCP, it would have a ***significant, negative, regional,*** and ***long-term*** impact on the TCP and an ***adverse effect*** under Section 106 because of the changes it would cause to the landscape. If this treatment were not utilized within the boundaries of the TCP, the impacts would be reduced.

Any avoidance of excavation activities in the vicinity of the TCP would diminish or eliminate adverse impacts to the TCP and would reduce the impacts to ***negligible, negative, local,*** and ***long term,*** and could result in a finding of ***no adverse effect*** for the TCP.

The incremental impacts on the TCP from excavation and removal offsite of non-treatable soil (320,000 $yd^3$) and the ex situ remediation of treatable soil (180,000 yd3) would be ***significant, negative, regional,*** and ***long term*** and an ***adverse effect*** under Section 106**,** because the action would alter the physical characteristics of the Sacred Site and TCP (***Cultural Impact-2a***)**.**

### *Archeological Resources*

This technology would require the removal of soil in impact areas, which would include roughly 0.65 acre within the Burro Flats boundary. None of the identified features of the Burro Flats site would be impacted. It is possible that one or more of these ex situ treatments could be used to treat the contaminated soil within the boundaries of Burro Flats. The excavation and removal of soil from Burro Flats to another location would result in ***significant, negative, regional,*** and ***long-term*** impacts to Burro Flats under NEPA and would be an ***adverse effect*** under Section 106 *(**Cultural Impact-2a**).* This technology also could result in ***moderate, negative, local,*** and ***long-term*** impacts on Archeological Site 2 if any of these treatments were used in this area. The effect on Archeological Site 2 from this moderate impact would be determined through further consultation with SHPO and consulting parties, if necessary. Archeological Site 1 is not located in any of the cleanup areas and would not be affected by ex situ treatments.

Avoidance of excavation in the vicinity of the known archeological sites would diminish or eliminate adverse impacts to known sites and reduce the impacts to ***negligible, negative, local,*** and ***long term*** and could result in a finding of ***no adverse effect*** for known archeological sites.

During excavation work for ex situ treatments, the possibility exists that previously undiscovered archeological sites could be encountered and affected. Impacts to previously undiscovered archeological sites found to be NRHP-eligible would result in additional ***significant, negative, local,*** and ***long-term*** impacts on cultural resources under NEPA and a finding of ***adverse effect*** under Section 106 *(**Cultural Impact-2a**)*.

The impacts on historic archeological resources from excavation and removal offsite of non-treatable soil (320,000 $yd^3$) and the ex situ remediation of treatable soil (180,000 $yd^3$) would be ***significant, negative, local,*** and ***long term*** and an ***adverse effect*** under Section 106 *(**Cultural Impact-2a**).*

### *Architectural Resources*

To remove the soil and treat it in another location, these ex situ treatments would require that historic structures located in remediation areas be removed if they had not already been demolished. This technology would require the removal of buildings and structures to treat the soil and would affect buildings that required demolition to carry out the treatment. The demolition of NRHP-eligible or -listed buildings would be a ***significant, negative, regional,*** and ***long-term*** impact on cultural resources under NEPA and an ***adverse effect*** on historic properties under Section 106 *(**Cultural Impact-2a**).*

The impact of the excavation and removal of 320,000 $yd^3$ of soil and the ex situ treatment technology would be ***significant, negative, regional,*** and ***long term*** on cultural resources under NEPA, which would be a finding of an ***adverse effect*** on historic properties under Section 106 **(*Cultural Impact-2a*).**

### Excavation and Offsite Disposal with In Situ Onsite Treatment

The in situ soil remediation technologies discussed in the following text would be used for treatable soil only after the 320,000 $yd^3$ or more of non-treatable soil had been excavated and removed. These technologies would be used to remediate the remaining 180,000 $yd^3$ of treatable soil. The analysis evaluates the overall impacts to cultural resources from the excavation and offsite disposal of 320,000 $yd^3$ of soil and the additional impacts from the in situ remediation technologies on the remaining 180,000 $yd^3$. The in situ remedial technologies would have similar impacts on cultural resources as ex situ remediation because both would require the excavation of 320,000 $yd^3$ of soil. The remaining soils would be treated in place and would not require excavation.

The soil vapor extraction (SVE) remediation technology requires drilling to install a series of vapor recovery wells, piping, and vacuums to extract vapor from the soil into the air. The in situ anaerobic or aerobic biological treatment technology would treat organic contamination in the soil using microorganisms. A network of injection wells or boreholes would be drilled and fluids would be injected into the subsurface to stimulate microbial growth. The in situ chemical oxidation treatment technology would treat organic contamination such as volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs) in the soil through a network of injection wells or drilled boreholes and fluids would be pumped into the subsurface to treat the contamination.

The wells and boreholes required for in situ treatment technologies would be placed roughly 10 to 12 ft apart (subject to change during the design phase) throughout the treatment area. The wells could be flush mounted in paved or concrete areas, so they would not be visible during the treatment. Wells located outside paved or concrete areas would extend approximately 3 ft above the surface, which would create a minor temporary, visual change to the viewshed. The pumps and equipment required at each well site would be on skid-mounted trailers, pulled to the site by a pickup truck and parked as needed. The depths of the wells and boreholes for the in situ technologies would be no more than 35 ft.

#### *Indian Sacred Site and Traditional Cultural Property*

These in situ technologies on the 180,000 $yd^3$ of treatable soil treat soil in place using equipment such as drilling and piping for wells and boreholes through which the soil is treated. The incremental effect on the Indian Sacred Site and TCP from this technology likely would be less than that for excavation methods, because it would require less ground disturbance, but these technologies would have some temporary visual impacts from the wells, piping, and holding tanks. The in situ technologies on their own would have *a **minor, negative, regional,** and **short-term*** impact on the Indian Sacred site and TCP and an effect finding of ***no adverse effect*** under Section 106.

The impact from excavation and removal of 320,000 $yd^3$ of soil in addition to the in situ treatments would be ***significant, negative, regional,*** and ***long term*** and an ***adverse effect*** under Section 106 to the Indian Sacred Site and the TCP *(**Cultural Impact-2b**)*.

#### *Archeological Resources*

These in situ technologies involve ground-disturbing activities such as drilling wells and bore holes. The exact locations that this remedial technology would be used have not been selected. The impacts to archeological resources from these technologies would depend on the presence or absence of known or unknown archeological remains at the sites where the wells were drilled. The maximum diameter of the drills used for the wells would be 8 inches, but would more likely be 4.5 to 5 inches in diameter. These wells and boreholes could impact archeological resources, but because the diameter would be so small, the impacts would be considered minimal. It is possible these technologies could be used in the 0.65 acre of the Burro Flats site and Archeological Site 2 with contaminated soils. Archeological Site 1 is not located in any of the cleanup areas and would not be affected by in situ treatments.

If the known archeological sites were avoided and no in situ wells, piping, or blowers were used at these sites, then there would be ***no impact*** to significant archeological sites and a finding of ***no historic properties affected***. If it were not possible to avoid the known archeological sites and ground-disturbing activities were required for in situ treatments, then the impacts to historic archeological resources would be ***moderate, negative, local,*** and ***long term,*** with a finding of ***adverse effect***.

Impacts on unknown archeological resources would be ***minor, negative, local,*** and ***short term*** and ***no adverse effect***, because it is unlikely that the wells adversely would affect any unknown deposits, but instead would cause only a minor impact.

The impact from excavation and removal of 320,000 $yd^3$ of soil in addition to the in situ treatments on the remaining 180,000 $yd^3$ of soil would be ***significant, negative, regional,*** and ***long term*** and an ***adverse effect*** under Section 106 to historic archeological resources *(**Cultural Impact-2b**).*

***Architectural Resources***

The wells, boreholes, piping, and holding tanks associated with in situ technologies could be located in areas that would avoid or minimize disturbances to historic structures. If wells and boreholes needed to be drilled on the interior of a historic structure, the equipment could be brought into the structure. This approach could damage the structure, by widening a doorway or removing part of a wall, but the damage likely would be minimal and repairable. The impacts to historic structures from in situ technologies would be ***minor, negative, local,*** and ***short term*** and ***no adverse effect***, unless a particular technology required removal of a building.

The impact to historic structures from excavation and removal of 320,000 $yd^3$ of soil combined with the in situ treatments would be ***significant, negative, regional,*** and ***long term*** under NEPA and an ***adverse effect*** under Section 106 *(**Cultural Impact-2b**).*

#### 4.3.1.3 Groundwater Cleanup

The groundwater remediation technologies listed in Section 2.2.3 would all have similar impacts to cultural resources. Monitored natural attenuation (MNA) and institutional controls, two additional technologies, would have lesser ground disturbing activities and fewer impacts to cultural resources. They are discussed separately from the other technologies. One or a combination of these technologies might be applied to meet the groundwater cleanup levels. Some ground disturbance would be necessary for the installation of wells, boreholes, piping, manifolds, tanks, or power source, but this work could be done in discrete locations to minimize impacts. Depths of wells and boreholes for these technologies could range from approximately 50 to 900 ft bgs. The drills for the wells would most likely be 4.5 to 5 inches in diameter, but could be as large as 8 inches. The piping would be above ground on small concrete pilings. Some infrastructure is already in place for the current groundwater treatments that could be used, thus reducing the impacts of these technologies.

The pump-and-treat technology, referred to as the groundwater extraction and treatment system (GETS), currently is being used at SSFL to recover contaminated groundwater and treat the contaminants using an ex situ treatment technology. Some pump-and-treat infrastructure is in place as part of the existing GETS. DTSC already has approved the installation of a pipeline as part of a groundwater interim measures plan. The pipelines could be installed in 2014 and would primarily follow roads and be within previously disturbed areas. Therefore, no impacts are anticipated to cultural resources from the GETS pipelines. Wells at depths ranging from approximately 50 to 900 ft bgs and 13,000 ft of aboveground pipeline would be added to the existing system. Vacuum extraction would require installation of a network of extraction wells using mechanical drilling methods. Groundwater would be extracted from the extraction well along with the vapors (via SVE) using blowers, pipelines, and manifolds. The extracted groundwater would be treated onsite and injected into the subsurface or released to surface drainage. Heat-driven extraction entails heating the subsurface to near or at the boiling point of water, using a series of wells or boreholes. The groundwater and surrounding matrix would be heated using steam, electrical resistance heating, heating elements, or other source of heat. Typical equipment includes piping, manifolds, heat source (steam, electric resistance heating, or heating elements), SVE system, heat exchangers, granular activated carbon system (or other vapor treatment system), and tanks.

In situ chemical oxidation and in situ enhanced bioremediation require a series of injection wells or boreholes. Oxidants or microorganisms would be delivered to the subsurface either by gravity feed or pumping via the injection wells. This effectiveness possibly could be enhanced by pneumatically fracturing the subsurface before the oxidants were introduced into the subsurface. Typical equipment for this process includes drilling rigs, tanks to hold the fluids, and pumps, hoses, and valves.

Although Section 4.3.1.1 provides a discussion of the impacts of up to 100 percent demolition of structures, it is possible some structures would not be demolished. As such, this subsection includes an analysis of potential impacts to historic structures from groundwater cleanup activities.

**Groundwater Remediation Technologies**

***Indian Sacred Site and Traditional Cultural Property***

These groundwater remediation technologies would require drilling rigs, tanks, pumps, hoses, valves, and power source. The wells and boreholes would be flush mounted on the ground or would extend roughly 3 ft into the air, thus creating a temporary visual alteration during implementation. There would be some ground disturbance for drilling the wells, but the impacts to the Indian Sacred Site or TCP would be minimal from this drilling. The ground disturbance for the installation of wells, boreholes, piping, and other materials could be done in discrete locations to minimize impacts. The impacts to the Indian Sacred Site and TCP from the referenced groundwater remediation technologies would be ***minor, negative, local,*** and ***short term*** under NEPA and a ***no adverse effect*** finding under Section 106 *(**Cultural Impact-3a**).*

***Archeological Resources***

These groundwater remediation technologies would require drilling rigs, tanks, pumps, and hoses and would drill to a depth between 50 and 900 ft bgs. The maximum diameter of the drills would be 8 inches, but more likely would be 4.5 to 5 inches in diameter. The footings for the pilings would have minimal ground impacts and the pumps, hoses, and valves would be above ground.

There are existing aboveground GETS pipelines within the Burro Flats site (CA-VEN-1072) from current groundwater cleanup activities as part of a separate action. It is possible additional groundwater cleanup technologies would be required within the Burro Flats site and at Archeological Site2. However, it currently is not known where these technologies might be used. If it was not possible to avoid the Burro Flats site or CA-VEN-1803 and ground-disturbing activities were required under one of these technologies, then there would be impacts to the Burro Flats site and to Archeological Site2. Archeological Site 1 would not be affected by groundwater cleanup activities.

If Burro Flats and Archeological Site 2 could not be avoided, the impacts from groundwater cleanup technologies could be ***moderate, negative, regional,*** and ***long term*** on cultural resources under NEPA, which would be an ***adverse effect*** under Section 106 ***(Cultural Impact-3b).*** If drilling sites could be placed to avoid known archeological sites, then there would be ***no impacts*** under NEPA, thus resulting in a finding of ***no historic properties affected*** under Section 106.

The impacts to previously unidentified archeological resources from these technologies would depend on the presence of archeological remains at the sites where the wells and boreholes were drilled. If previously unidentified archeological sites were found to be NRHP-eligible and could not be avoided, the impacts from the groundwater cleanup technologies could be ***moderate, negative, local,*** and ***long term*** on cultural resources under NEPA, which would be an ***adverse effect*** under Section 106 ***(Cultural Impact-3b).*** If drilling could avoid previously unidentified archeological sites found to be NRHP-eligible, then there would be ***no impacts*** under NEPA, resulting in a finding of ***no historic properties affected*** under Section 106**.**

***Architectural Resources***

The wells, piping, and holding tanks associated with these groundwater cleanup technologies could be located in areas that would avoid or minimize disturbances to historic structures. If wells and boreholes needed to be drilled on the interior of a building, the equipment could be brought inside the structure. This approach could damage the structure, by widening a doorway or removing part of a wall, but the damage likely would be minimal and reversible. The impacts to historic structures from groundwater cleanup technologies would be ***minor, negative, local,*** and ***short term*** and ***no adverse effect (Cultural Impact-3a)***, unless a particular technology required removal of a building, which would be unlikely. If historic properties could be avoided and cleanup infrastructure could be located away from known historic structures, there would be ***no impact*** from groundwater remediation and ***no historic properties affected*** under Section 106.

**Monitored Natural Attenuation**

NASA could use MNA to evaluate the reduction in contamination over a period of time once another treatment technology had been implemented or the naturally occurring attenuation processes had proven effective in reducing contamination in the subsurface. The data collected during the MNA study could be used to evaluate if contamination levels would reach the groundwater cleanup levels or if other remedial technologies would need to be implemented. MNA could be implemented as an independent remedial approach or in coordination with any other remedial technology. There are minimal physical effects from MNA, because it would require little to no ground disturbance and would not require demolition of structures.

***Indian Sacred Site and Traditional Cultural Property***

There would be ***no impact*** to the Indian Sacred Site and TCP from MNA and ***no historic properties affected*** because there would be little to no ground disturbance and no demolition *(**Cultural Impact-3c**)*.

***Archeological Resources***

There would be ***no impact*** to historic archeological resources or previously unidentified resources from MNA and ***no historic properties affected*** under Section 106 because there would be little to no ground disturbance and no demolition *(**Cultural Impact-3c**)*.

***Architectural Resources***

There would be ***no impact*** to historic architectural resources from MNA and ***no historic properties affected*** under Section 106 because there would be no demolition of structures *(**Cultural Impact-3c**).*

**Institutional Controls**

Implementation of institutional controls, including deed restrictions, fencing, signage, and other security measures likely would not affect historic properties because the only ground disturbance required would be for the installation of signage and possibly fencing, and no demolition would be necessary.

***Indian Sacred Site and Traditional Cultural Property***

Potential impacts to the Indian Sacred Site and a TCP for institutional controls would include visual impacts from the fencing and signage and potential loss of access to the site after the fencing was installed. The impacts from institutional controls would be ***minor, negative, local,*** and ***short term*** and would be reversible; thus, there would be a finding of ***no adverse effect*** under Section 106 (***Cultural Impacts-3d***). Design and installation of fencing would be considered in consultation with SHPO and the tribes. If signage and fencing were not used and there were no visual alterations or ground disturbance, there would be ***no impact*** to cultural resources under NEPA and ***no historic properties affected*** under Section 106.

***Archeological Resources***

Impacts to historic archeological resources from industrial controls potentially would occur from constructing a fence; the other measures would not involve ground disturbance. Building a fence could require minimal ground-disturbing activities. If these activities were outside the known archeological sites, there would be ***no impact*** to historic archeological sites from institutional controls, which would be a finding of ***no historic properties affected*** under Section 106 *(**Cultural Impact-3c**).*

***Architectural Resources***

Under NEPA, there would be ***no impacts*** to architectural resources from the types of activities related to institutional controls. Under Section 106, there would be a finding of ***no historic properties affected (Cultural Impact-3c****).*

## 4.3.2 Mitigation Measures

This subsection provides a brief description of impacts previously discussed in detail, along with corresponding mitigation measures. Mitigation is an action that will benefit the environment, but must be agreed to by agency stakeholders and NASA. Agreed-upon mitigation measures would be provided in the agreement document among the tribes, consulting parties, ACHP, and SHPO, or they will be included in the ROD. These impacts and mitigation measures are numbered to correspond to the impact summary table provided in Section 4.3.4.

Consultation with SHPO, ACHP, Native Americans, and other consulting parties is ongoing; consultation is in the final stages regarding agreement on appropriate measures to avoid, minimize, or mitigate adverse effects on historic properties. Mitigation measures reached through consultation will be commensurate with the magnitude of the undertaking and the complexity of the adverse effect. The agreement document among the parties will stipulate the final commitments resulting from consultation with the SHPO, ACHP, Native Americans, and other consulting parties.

Mitigation measures to address the adverse effect on historic properties are discussed in the following paragraphs. These measures have been discussed with consulting parties as part of the Section 106 consultation process. The Section 106 consultation process will culminate in the executed agreement document. It is possible the Final EIS will be completed prior to execution of the agreement document, so the ultimate mitigation measures could vary from those shown here. A binding commitment to these measures will be part of the ROD for the EIS.

***Cultural Mitigation Measure-1:*** **Demolition Deferral.** NASA will defer demolition of the Alfa and Bravo Test Stands and Control Houses (including Structures 2208, Alfa Control House; 2727, Alfa I Test Stand; 2728, Alfa III Test Stand; 2X and 2Y Alfa Observation Structures or Pill Boxes; 2213, Bravo Control House; 2730 Bravo I Test Stand; 2731, Bravo II Test Stand; 2Z, Observation Structure; and associated tanks near the test stands) until January 2016. NASA will identify whether these structures must be demolished to achieve the required cleanup goals and which structures could be preserved. Upon completion of cleanup activities and based on consultation with the SHPO and GSA, NASA will provide and maintain a fenced enclosure around any remaining test stands until property is transferred. ***Cultural Impact-1c*** would remain a significant impact with this mitigation measure, as the Coca Test Area Historic District and contributing buildings to the Alfa and Bravo Test Area Historic Districts would be demolished, but fewer of the significant structures on NASA-administered property would be demolished as a part of the Proposed Action.

***Cultural Mitigation Measure-2:*** **Documentation.** Prior to demolition of structures within historic districts, NASA will complete Historic American Engineering Record (HAER) Level I documentation of test stands in Alfa, Bravo, and Coca Test Area Historic Districts; HAER Level II documentation for Control Houses within each district; and HAER Level III documentation for all remaining contributing structures to the Alfa, Bravo, and Coca Test Area Historic Districts. NASA will post on the NASA website a collection of historic photos and the historic narrative from existing surveys of SSFL, as well as provide the same on a CD for interpretive displays at museums, schools, organizations, or a potential interpretive center. Finally, NASA will conduct 10 oral histories of personnel who worked at SSFL for inclusion on NASA's oral history website at http://www.jsc.nasa.gov/history/nasa_history.htm, with links to other NASA websites. NASA will retain several special or representative pieces of demolished test stands for display in local museums or through the NASA artifacts module at http://gsaxcess.gov/nasawel.htm. ***Cultural Impact-1c*** would remain a significant impact after implementation of this mitigation measure, but these significant structures will be recorded and documented prior to demolition.

***Cultural Mitigation Measure-3:*** **Treatment of Traditional Cultural Property.** NASA will conduct an extended ethnographic study that will contain additional in-depth research including archeological investigations conducted by Boeing, U.S. Deparatment of Energy (DOE), and NASA and interviews to provide a greater understanding of the historic use and associations of the TCP. NASA also will establish a Native American Advisory Board (NAAB) comprising volunteer representatives from federally recognized Indian Tribes and state-listed Tribes, and other state and local Tribes with an interest in the protection of Native American sites on NASA's portion of SSFL. The NAAB will provide expertise and input on the ethnographic study and in identifying ongoing issues related to the management and protection of Native American sites including the TCP. Finally, NASA will complete a nomination of the TCP to the NRHP in consultation with SHPO, Boeing, DOE, NAAB, the Santa Ynez, and the U.S. National Park Service (NPS). ***Cultural Impacts-2a** and **2b*** would remain significant impacts after implementation of Cultural Mitigation Measure-3, but NASA would contribute additional information to the existing literature of the ethnographic history of the area.

***Cultural Mitigation Measure-4:* Treatment of Burro Flats Site.** Prior to cleanup excavation activities, NASA will conduct further archeological investigations within the APE to confirm the extent of the Burro Flats Site Boundary on NASA land. In consultation with the Santa Ynez and Boeing, NASA will establish how the property meets the NRHP criteria, and develop an updated NRHP nomination form to be submitted to the SHPO. NASA will provide archeologist and/or Native American monitors for field sampling within the Burro Flats Site Boundary. Prior to the finalization of the Implementation Plan, NASA will submit to DTSC the revised Burro Flats Site Boundary that lies within the APE and request that any cleanup required to meet DTSC standards identified in the AOC within the Burro Flats Site Boundary be considered part of the "Native American Artifacts" exceptions clause identified in the Agreement in Principle of the AOC and be exempted from the cleanup requirement. If DTSC determines that there is an unacceptable health risk that requires environmental cleanup within the Burro Flats Site Boundary, NASA and DTSC, in consultation with the Santa Ynez and SHPO, will identify which areas will require cleanup to meet the prescribed health risk identified by DTSC. If the cleanup methodology requires excavation within the Burro Flats Site Boundary, NASA will develop a Phase III data recovery plan, which will include a provision for Native American monitors, and submit it to the SHPO and Santa Ynez. If the Santa Ynez requests that NASA refrain from conducting data recovery within or around the Burro Flats site boundary, NASA will work with the Santa Ynez and SHPO to identify an alternative mitigation.  Finally, NASA will update the Standard of Practice for Archeological Resource Protection Act Compliance Review and Preventing Vandalism to Archeological Sites in the SSFL Integrated Cultural Resources Management Plan (ICRMP) (NASA, 2009c) to include protection during demolition and cleanup activities. ***Cultural Impacts-2a, and 2b*** would remain significant impacts, but NASA would add critical information to the body of work regarding the significant Burro Flat site and would protect the site during cleanup activities.

***Cultural Mitigation Measure-5:* Treatment of Other Archeological Properties.** NASA will conduct Extended Phase I archeological investigations, including Native American monitors, in the cleanup area footprint where NASA plans to excavate soil to achieve cleanup goals. Cultural resources identified within the Extended Phase I investigations will be evaluated in accordance with 36 CFR 63 and bulletins, guidance, and documents produced by the NPS, in consultation with the SHPO and Santa Ynez, to determine if they are eligible for listing in the NRHP. If the cleanup footprint includes previously identified sites or an archeological site is found within the cleanup footprint that meets the NRHP eligibility criteria, NASA will request that the site be considered part of the "Native American Artifacts" exceptions clauses identified in the Agreement in Principle of the AOC and be exempted from the cleanup requirement. If the AOC Exception Consideration does not apply and NASA is required to conduct cleanup that will adversely affect the archeological site, NASA will develop a Phase III data recovery plan, which will include a provision for Native American monitors, and submit it to the SHPO and Santa Ynez. NASA will update the SSFL ICRMP (NASA, 2009c) to include NRHP-eligible site(s) and to include protection measures during demolition and cleanup activities. Finally, if active protection measures are needed to protect newly identified sites during demolition and/or cleanup activities, and NASA's qualified personnel determine that certain protection measures can be installed without adverse effects to the NRHP-eligible archeological site(s), then NASA will proceed with installation using archeological or Native American monitoring. If the protection measure is likely to cause an adverse effect, NASA will consult with the SHPO and NAAB to identify ways of minimizing the effects. ***Cultural Impacts-2a, and 2b*** would remain significant impacts following implementation of this mitigation, but NASA would add critical information to the body of work regarding archeological resources and would put in place protection measures for the significant resources during cleanup activities.

### 4.3.3 No Action Alternative

Under the No Action Alternative, NASA would not demolish test stands, ancillary structures, or other historic structures on the NASA-administered property of SSFL and no ongoing monitoring of test stands would take place. Furthermore, NASA would not conduct soil remediation on the NASA-administered property of SSFL or conduct groundwater treatment beyond the GETS and ISRA activities currently being conducted under separate regulatory direction.

The No Action Alternative would result in ***no impacts*** to historic properties under NEPA and ***no historic properties affected*** under Section 106.

### 4.3.4 Summary of Impacts and Mitigation Measures

The Proposed Action (demolition, soil cleanup to background, and groundwater cleanup) would have a ***significant, negative, regional,*** and ***long-term*** overall impact on cultural resources under NEPA and an ***adverse effect*** on historic properties under NHPA. There would be significant impacts to the Indian Sacred Site, TCP, archeological resources, and architectural resources. Consultation regarding appropriate measures to mitigate the adverse effects and significant impacts to cultural resources is ongoing with SHPO, ACHP, Native Americans, and consulting parties. After mitigation measures have been carried out, the impact on cultural resources would remain ***significant, negative, regional,*** and ***long term***.

Table 4.3-1 provides a summary of the impacts on cultural resources, as described in this subsection. Impact numbering in the text corresponds to Table 4.3-1, which concludes with an overall alternative impact level based on the highest level of impact identified in the analysis.

TABLE 4.3-1
**Summary of Cultural Resources Impacts and Mitigation Measures**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Impacts[a] | Project Alternatives[a] | | Mitigation Measures[a] | Impact After Mitigation Measure Implementation[a] |
|---|---|---|---|---|
| | **Proposed Action** | **No Action** | | |
| Cultural-1a: Impacts on Sacred Site and TCP from proposed demolition | Negligible, beneficial, regional, and long term<br>*No adverse effect under Section 106*<br>○ | No impact<br>▽ | Cultural MM-3 | Negligible, beneficial, regional, and long term<br>○ |
| Cultural-1b: Impacts on historic archeological resources from proposed demolition | Minor, negative, local, and long term<br>*No adverse effect under Section 106*<br>**○** | No impact<br>▽ | None | N/A |
| Cultural-1c: Impacts on historic districts and historic structures from proposed demolition | Significant, negative, regional, and long term<br>*Adverse effect under Section 106*<br>● | No impact<br>▽ | Cultural MM-1<br>Cultural MM-2 | Significant, negative, regional, and long term<br>● |
| Cultural-1d: Impacts on historic districts from proposed demolition of noncontributing structures or structures outside of the district boundaries | Minor, negative, local, and long term<br>*No adverse effect under Section 106*<br>**○** | No impact<br>▽ | None | N/A |
| Cultural-2a: Impacts on Sacred Site, historic archeological resources, historic districts, and historic structures from proposed excavation and offsite disposal and ex situ soil remediation technologies | Significant, negative, regional, and long term<br>*Adverse effect under Section 106*<br>● | No impact<br>▽ | Cultural MM-1<br>Cultural MM-2<br>Cultural MM-3<br>Cultural MM-4<br>Cultural MM-5 | Significant, negative, regional, and long term<br>● |
| Cultural-2b: Impacts on Sacred Site, TCP, historic archeological resources, historic districts, and historic structures from proposed excavation and offsite disposal and in situ soil remediation technologies | Significant, negative, regional, and long term<br>*Adverse effect under Section 106*<br>● | No impact<br>▽ | Cultural MM-1<br>Cultural MM-2<br>Cultural MM-3<br>Cultural MM-4<br>Cultural MM-5 | Significant, negative, regional, and long term<br>● |

TABLE 4.3-1

**Summary of Cultural Resources Impacts and Mitigation Measures**

*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Impacts[a] | Project Alternatives[a] | | Mitigation Measures[a] | Impact After Mitigation Measure Implementation[a] |
|---|---|---|---|---|
| | **Proposed Action** | **No Action** | | |
| Cultural-3a: Impacts on Sacred Site, TCP, historic districts, and historic structures from proposed groundwater remediation technologies (pump-and-treat, vacuum extraction, heat-driven extraction, in situ chemical oxidation, and in situ enhanced bioremediation) | Minor, negative, local, and short term<br>*No adverse effect under Section 106*<br>○ | No impact<br>▽ | Cultural MM-1<br>Cultural MM-2<br>Cultural MM-3<br>Cultural MM-5 | Minor, negative, local, and short term<br>○ |
| Cultural-3b: Impacts on historic archeological resources from proposed groundwater remediation technologies (pump-and-treat, vacuum extraction, heat-driven extraction, in situ chemical oxidation, and in situ enhanced bioremediation) | Moderate, negative, regional, and long term<br>*Adverse effect under Section 106*<br>◉ | No impact<br>▽ | Cultural MM-4 | Moderate, negative, regional, and long term<br>◉ |
| Cultural-3c: Impacts on Sacred Site, TCP, historic archeological resources, historic districts, and historic structures from proposed MNA; impacts on historic archeological resources, historic districts, and historic structures from proposed Institutional controls for groundwater remediation | No impact<br>No historic properties affected under Section 106<br>▽ | No impact<br>▽ | None | N/A |
| Cultural-3d: Impact on Sacred Site and TCP from proposed institutional controls for groundwater remediation | Minor, negative, local, and short term<br>*No adverse effect under Section 106*<br>○ | No impact<br>▽ | Cultural MM-3 | Minor, negative, local, and short term<br>○ |

TABLE 4.3-1
**Summary of Cultural Resources Impacts and Mitigation Measures**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Impacts[a] | Project Alternatives[a] | | Mitigation Measures[a] | Impact After Mitigation Measure Implementation[a] |
|---|---|---|---|---|
| | Proposed Action | No Action | | |
| **Overall Alternative Impact to Cultural Resources** | Significant, negative, regional, and long term<br>*Adverse effect under Section 106*<br>● | No impact<br>▽ | Cultural MM-1<br>Cultural MM-2<br>Cultural MM-3<br>Cultural MM-4<br>Cultural MM-5 | Significant, negative, regional, and long term<br>● |

Notes:
● or ■ = Significant
◉ or ▣ = Moderate
○ (bold) or ▣ (bold outline) = Minor
○ or □ = Negligible
▽ = No impact
Circular symbols represent negative impacts while square symbols represent beneficial impacts, and the degree to which the symbol is filled represents the severity of the impact.
MM = mitigation measure
[a] Potential impacts, BMPs, and mitigation measures are discussed further in Sections 4.3.1 through 4.3.3.

# 4.4 Biological Resources

This subsection describes the potential impacts to biological resources within the ROI under the No Action Alternative or as a result of implementing the Proposed Action. The ROI for biological resources is generally the NASA-administered property at SSFL; however, when necessary, a broader overview of the ecoregion or watershed is considered.

Section 4.4.1 includes a summary of the impact analysis to the biological resources under the various soil and groundwater cleanup scenarios. Section 4.4.2 provides information about potential impacts, BMPs, and mitigation measures applicable to biological resources. Section 4.4.3 provides a discussion of the No Action Alternative. Section 4.4.4 includes a summary table of impacts and corresponding BMPs and mitigation measures identified in the site biological resources analysis. Impacts, BMPs, and mitigation measures are numbered to correspond with the summary table to indicate where impacts might occur and how BMPs and mitigation measures might offset those impacts.

The analysis of impacts on biological resources was based on the findings of the 2010, 2011, and 2013 field surveys (NASA, 2011b, 2011d; ECS, 2012; NASA, 2012b; included as Appendixes D, E, F, and G), review of other SSFL studies, readily available resource data, literature review, ongoing regulatory discussions, and professional opinion.

The evaluation criteria for biological resources include disturbance, displacement, and mortality of plant and wildlife species and destruction of sensitive habitat. These measures are the basis for the evaluation criteria used to assess the potential impacts of the Proposed Action and the No Action Alternative.

The following descriptions identify the thresholds of impacts relevant to the biological resources analysis:

| Impact | Description |
|---|---|
| No Impact | No impacts to biological resources would be expected. |
| Negligible | Impacts to biological resources would not be expected to be detectable and would not alter resource conditions. |
| Minor | Impacts to biological resources would result in little, if any, loss of resource integrity. Impact would not appreciably alter resource conditions or long-term or permanent changes of population use of habitats. |
| Moderate | Impacts to biological resources would result in disturbance to a site, loss of integrity, and/or alteration of resource conditions. Impact would appreciably alter biological resource conditions. |
| Significant | Impacts to biological resources would result in severe disturbance to a site, loss of integrity, and/or alteration of resource conditions. Impact would appreciably alter resource conditions and could be severe and long lasting. |
| Quality: | Beneficial–would have a positive effect on the biological resources or physical environment.<br>Negative–would have an adverse effect on the biological resources or physical environment. |
| Proximity: | Local–would occur within the NASA-administered property at SSFL.<br>Regional–would occur outside the NASA-administered property at SSFL. |
| Duration: | Short term–would occur only during the proposed demolition and immediate remediation period.<br>Long term–would continue beyond the proposed demolition and immediate remediation period. |

## 4.4.1 Proposed Action–Demolition, Soil Cleanup to Background Levels, and Groundwater Cleanup

### 4.4.1.1 Sensitive Species

Because sensitive species could be present during any phase of the proposed action, they are discussed individually in this subsection, while potential impacts to sensitive species during the Proposed Action phases are described in the corresponding subsections.

The following discussion includes species listed by the U.S. Fish and Wildlife Service (USFWS) (threatened, endangered, or a candidate) or by the California Department of Fish and Wildlife (CDFW) (rare, Species of Special Concern [SSC], or fully protected) and were observed in the ROI during the 2010, 2011, and 2013 surveys (NASA, 2011b, 2011d). Sensitive species have been divided into plant and wildlife categories. Impacts to sensitive species were assessed at the population level, except in the case of federally listed threatened or endangered species, in which case an impact to an individual organism would be considered ***significant***.

NASA consulted with USFWS for the Proposed Action because of the presence of listed federal species within the ROI. On December 13, 2013, the USFWS concurred with NASA's determination that the Proposed Action may affect, but is not likely to adversely affect, the Braunton's milk-vetch, Least Bell's vireo, California red-legged frog, Riverside fairy shrimp, and vernal pool fairy shrimp (USFWS, 2013b). A brief explanation of the findings are provided in the paragraphs that follow. Mitigations required by the USFWS during the consultation are described in Section 4.4.4.

**Listed Plant Species**

***Santa Susana tarplant.*** The only listed plant species observed in the ROI is the Santa Susana tarplant, which is state-listed rare. The Santa Susana tarplant is an aggressive colonizer that is locally abundant and present throughout the ROI and in other areas of Ventura and Los Angeles counties (Baldwin, et al., 2012). The Proposed Action could have a negative effect on the Santa Susana tarplant through disturbance and mortality of individual populations during soil remediation, demolition, and mitigation efforts. However, because a large Santa Susana tarplant population exists adjacent to and within the remediation areas, potential impacts would not adversely affect the survival, reproduction, or productivity of the regional populations. Consequently, the effects on the local population of the Santa Susana tarplant would be ***moderate, negative, local,*** and ***long term (Biology Impact-1a)***.

***Braunton's milk-vetch.*** Although Braunton's milk-vetch, a federally listed endangered species, has not been observed in the NASA-administered areas (NASA, 2011b; 2011d), soil conditions indicate that habitat could be supported in the northeastern portion of NASA Area II and in the southern portion of the Liquid Oxygen (LOX) Plant Area I. Also, an abundance of Braunton's milk-vetch has been observed in the DOE-administered areas. Nonetheless, because the species was not identified during the surveys and no critical habitat exists within the ROI, there are ***no expected*** impacts to Braunton's milk-vetch.

**Listed Wildlife Species**

***Least Bell's vireo.*** One specimen of Least Bell's vireo, a federal and state-listed endangered species, was observed during the site surveys, although it appeared to be transient and no nests were found (NASA, 2011d. There are ***no expected impacts*** to the Least Bell's vireo, because suitable habitat for the Least Bell's vireo within the ROI is of limited quality and quantity and nesting has not been documented within the Proposed Action area (USFWS, 2013b).

***Quino checkerspot butterfly.*** A qualified entomologist surveyed the ROI for the Quino checkerspot butterfly, a federally listed endangered species, and observed no specimens. Furthermore, the entomologist found the potential butterfly habitat to be marginal (ECS, 2012). Because there is a minimal likelihood of encountering a Quino checkerspot butterfly during remediation and demolition, there would be ***no expected impacts*** to this species**.**

***California red-legged frog.*** No signs of the California red-legged frog, a federally threatened species, were observed during surveys (NASA, 2011b; 2011d), and suitable habitat for the frog is of limited quantity (USFWS, 2013b). The ponds within the ROI are suitable to support this species. Areas where the frog could be supported include the R2 Ponds and the detention basin north of the Coca test stand site. The Proposed Action could affect the red-legged frog through temporary habitat modification if groundwater remediation wells were installed around the R2 Ponds and the detention basin north of the Coca test stand site, and the species were present. Impacts to the California red-legged frog, if it were present, would be ***significant, negative, regional,*** and ***long term (Biology Impact-1b)***. However, because the likelihood of the species being present within the ROI is low and limited potential habitat exists, the potential for this impact is considered very low.

***Fairy shrimp.*** Two species of federally listed fairy shrimp have the potential to exist within the ROI. The Riverside fairy shrimp is federally listed as endangered and the vernal pool fairy shrimp is federally listed as threatened. These species could exist in the seasonal wetlands and small pools in rock outcrops at SSFL, but none have been identified within the remediation area.Rock outcrops, which might support these habitats, would be avoided during cleanup activities. Consequently, there would be ***no expected impacts*** to listed fairy shrimp populations.

***Coast horned lizard.*** The coast horned lizard, a CDFW SSC reptile species, was observed in NASA Area I and Area II. During the fall 2010 survey, it was sighted within the proposed remediation boundary near the Area II Landfill (Figure 4.4-1) (NASA, 2011b). Because only one specimen was observed in the remediation area (NASA, 2011b), indicating that the population size is small, the impacts to population stability would be ***minor, negative, local,*** and ***short term (Biology Impact-1c).***

***Two-striped garter snake.*** The two-striped garter snake, a CDFW SSC reptile species, was observed near the LOX Plant site in NASA Area I and another snake was photographed at the R-2 Pond during a public tour. The observations were outside the remediation area (Figure 4.4-1); however, there is still a potential for the species to be present within the remediation area. Furthermore, snake species often bask on roadways; consequently, the increased truck traffic could result in individual mortality. The impacts to the snake population would be ***minor, negative, local*****,** and ***short term (Biology Impact-1d)****.*

***Loggerhead shrike.*** The loggerhead shrike, a CDFW SSC bird species, was sighted during the fall 2010 survey flying near the Storable Propellant Area (SPA) site of Area II (NASA, 2011b) and foraging on a hill above the viewing stand at the Bravo Test Stand site during the August 2011 survey (NASA, 2011d). These observations were within the proposed remediation area and the loggerhead shrike may be a resident nesting species in the region. However, because only two specimens were observed, indicating that the population in the region is small, the impacts to the loggerhead shrike populations would be ***minor, negative, local*****,** and ***short term (Biology Impact-1e)****.*

***Ring-tailed cat.*** A ring-tailed cat, a CDFW fully protected species, was observed outside, although near, NASA Area II (Figure 4.4-1). Because no specimens were identified within the ROI and the species likely would avoid human activity, there would be ***no expected impacts*** to the ring-tailed cat. If a ring-tailed cat were identified during the operation, the CDFW would be contacted.

#### 4.4.1.2 Demolition

The NASA facilities to be demolished and the associated staging areas are located in disturbed and developed areas. Once the facilities had been demolished completely, the area would be contoured to allow for natural revegetation. Demolition is expected to take roughly a year to complete. Demolition activity would involve large equipment and increased noise in the vicinity.

**Native Vegetation Communities**

The demolition and regrading is expected to occur mostly in previously disturbed or graded areas. Some disturbance of native vegetation is possible during the removal of structures such as test stands that have vegetation growth right up to the structures. However, because of the small acreage, impacts to native vegetation communities as a result of the demolition activity would be ***minor, negative, local,*** and ***long term (Biology Impact-2a)****.* Over time, the demolition would increase the amount of undeveloped, vegetated area and would have a ***minor, beneficial, local****,* and ***long-term*** impact ***(Biology Impact-2b)*** on surrounding native vegetation through increased habitat availability, rainfall infiltration, and slow stormwater runoff**.**

Demolition activities could increase the spread of invasive and noxious weed species by transporting weeds around the site and redistributing them. Weed species could out-compete native species in areas where soils had been exposed and weed species could become dominant in areas previously suitable only for locally adapted plants. In addition, weed species could out-compete native plants in areas where a soil remediation technology, such as land farming, added nutrients to the soils. The increased presence of weeds would cause a ***moderate, negative, regional,*** and ***long-term*** impact ***(Biology Impact-2c)*** on native vegetation and wildlife.

### Wildlife

Large-scale demolition could intimidate wildlife through noise, human presence, and loss of habitat. Most wildlife would vacate the operation areas and return once vegetation had been reestablished. Direct impacts from mortality to smaller, less-mobile species could occur during operations if those species were present, although this mortality would be to individuals and would not measurably affect population stability. Direct impacts to non-sensitive wildlife populations due to demolition would be ***minor, negative, local,*** and ***short term (Biology Impact-3a)***.

### Sensitive Species

Specific impacts to USFWS- and CDFW-listed species from the cleanup efforts are identified in Section 4.4.1.1. If a species listed as threatened or endangered by the USFWS was harmed during demolition, it would be a ***significant, negative, regional,*** and ***long-term*** impact ***(Biology Impact-1f)***. NASA worked with the USFWS to develop appropriate mitigation measures to lessen such impacts. Impacts to CDFW-listed species would depend on the number of organisms harmed during demolition activities and the impact to the species populations. These impacts range from ***minor, negative, local,*** and ***long term (Biology Impact-1g)*** for the Santa Susana tarplant, to ***moderate, negative, local,*** and ***short term (Biology Impact-1h)*** for CDFW SSC species.

### Migration Linkages

The NASA-administered areas of SSFL are located adjacent to a potential migration corridor for numerous wildlife species (South Coast Wildlands, 2008). Because demolition activities are expected to occur mostly in previously disturbed areas, it is unlikely the demolition activities would impact existing migration routes. If migrating species are present during demolition, the impacts would be similar to **Biology Impact-3a.Migratory Birds**

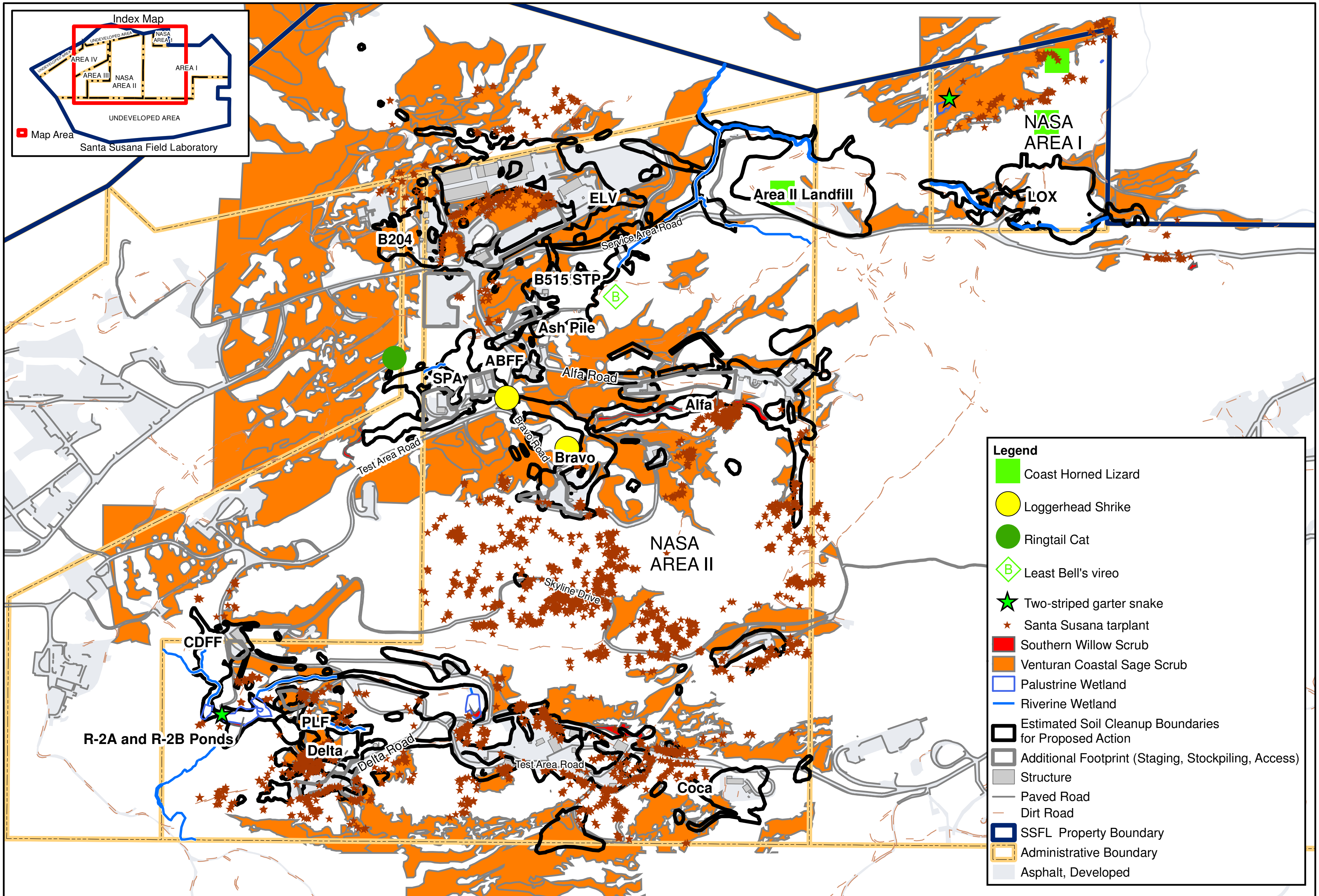
Federal entities are required to limit their impacts on migratory birds through the Migratory Bird Treaty Act of 1918. Generally speaking, migratory birds include all native birds in the United States. Using this definition, 59 bird species observed in the NASA-administered property (NASA, 2011b) could be considered migratory birds. Migratory bird species have been observed nesting on test stands, transformer poles, and other structures. If demolition activities were to begin before or after the nesting season, these bird species would be expected to vacate the area during demolition activities and to find alternative nesting sites. However, if demolition activities were to start during nesting season, individual organisms would be disturbed. Impacts to migratory birds would be ***moderate, negative, regional,*** and ***short term (Biology Impact-4a).***

### Species with Native American Cultural Uses

Individual plants of Native American use could be disturbed during demolition. However, a search was conducted to evaluate the distribution and status of plants and animals identified as species used by Native Americans. None of the species listed in Table 3.4-4 has been identified by the USFWS, CDFW, or California Native Plant Society (CNPS) as a species of concern, and the distribution of these species extends beyond the SSFL boundaries (U.S. Department of Agriculture [USDA,] 2013; Baldwin, et al., 2012; NatureServe, 2013). Therefore, because of the small size of the disturbance area, the impact to population stability of these species would be ***negligible, negative, local,*** and ***short term (Biology Impact-5a).***

### Wetlands

There are no wetlands located in the demolition area; therefore, there would be ***no impact*** on wetlands from demolition activities.




0 500 1,000 2,000 Feet
0 150 300 600 Meters

10-Apr-2013
Drawn By:
A. Cooley

**Figure 4.4-1**
**Biological Resources - Proposed Action**
**NASA - Santa Susana Field Laboratory**
**EIS for Proposed Demolition and Environmental Cleanup**

Map Document: O:\NASA\SSFL\maps\EIS_2011\BiologicalResources_ProposedAction_SDE.mxd

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#### 4.4.1.3 Soil Cleanup to Background

This subsection discusses the potential effects of the soil remedial activities on biological resources. The analysis recognizes that in sequencing the demolition and cleanup activities for efficient management of the proposed action, the majority of demolition would occur ahead of the related cleanup. Figure 2.2-2 shows the general footprints of the proposed remediation areas under the Proposed Action. The total area of the remediation footprint is 105 acres.

Under the Proposed Action, NASA would remediate the soils within the impact area footprint. Cleaning up the soils to background means the removal of soils contaminated at concentrations above the local background levels. Soils would be sampled and characterized prior to transport to confirm soil content and to identify the appropriate handling and disposal facility. The soil depth that would require cleanup would be approximately 2 ft (320,000 $yd^3$ removed), but could go down to 20 ft bgs (500,000 $yd^3$ removed). However, because the overall footprint would remain the same regardless of how deep the soil removal was, impacts to biological resources would be similar whether 320,000 or 500,000 $yd^3$ of soil were removed, because the total area affected in either case would be the same.

For each cleanup technology in the following subsections, potential impacts to natural resources from each remedial technology are discussed. The level of ground disturbance resulting from a technology is proportional to the direct impacts to biological resources. Therefore, the technologies are listed in order of their potential for ground disturbance, from highest to lowest impact. The key negative impacts to biological resources from the soil remediation technologies would include loss of the existing soil profile and removal and disturbance of native vegetation, including sensitive species:

- Excavation and offsite disposal
- Ex situ treatments
- In situ treatments

Each cleanup technology in the following subsections is discussed in terms of potential impacts to natural resources from each remedial technology.

***Excavation and Offsite Disposal***

**Native Vegetation Communities**

The proposed soil remediation areas analyzed under the Proposed Action (Figure 2.2-2) total approximately 105 acres. Of this area, 63 percent is composed of developed and non-natural habitats. The highest proportion of disturbance to natural habitats would occur to chaparral habitat.

Excavation of non-treatable surface soils (first 320,000 $yd^3$ and approximately 105 acres) would result in the potential elimination of existing soils on approximately 39 acres of native habitat within the ROI for at least 2 ft and up to 20 ft of soil across the footprint identified in Figure 4.4-1. Once the soil was removed, the existing micro-ecosystem might never be restored. It can take years for native species to reestablish in disturbed areas, and the species composition would be different from what was originally there, despite reseeding with approved native plant seeds. Whenever possible, topsoil would be imported, along with backfill, to replace the remediated topsoil; however, the sources of native topsoil within the vicinity of SSFL are limited and are unlikely to supply enough topsoil to replenish the entire 39-acre area. If non-native soil were to be used, it would be unlikely to support the current plant distributions on SSFL. The impacts to native vegetation communities on SSFL from excavation of non-treatable soils to meet the Look-Up Table requirements would result in ***significant, negative, local,*** and ***long-term*** impacts *(**Biology Impact-2d**).*

High-priority conservation habitats, as defined by the CDFW, make up approximately 9 percent of the remediation area, with approximately 0.05 acre of southern willow scrub and 7 acres of Venturan coastal sage scrub, which have been identified as high-priority conservation habitats by CDFW. Within the ROI these communities most likely would be destroyed during soil excavation operations, resulting in ***significant, negative, local,*** and ***long-term*** impacts. Because the communities within the ROI (less than 10 acres) represent a small percent of the regional populations, impacts would remain at the ***local*** level *(**Biology Impact-2e**).* No excavation material would be placed in sensitive habitats.

Excavation could increase the spread of invasive and noxious weed species. Weed species could out-compete native species in areas where soils were exposed, and weed species could become dominant in areas previously suitable only for locally adapted plants. In addition, introduced weed species could out-compete native plants in areas. Removal of native vegetation during excavation and aerobic biological treatments could induce the spread of noxious weeds. These factors could lead to a ***significant, negative, regional,*** and ***long-term*** impact on native vegetation and wildlife *(**Biology Impact-2f**)*.

**Wildlife**

Large-scale excavation for cleanup areas would eliminate vegetation, create physical barriers, and intimidate wildlife through noise, human presence, and loss of habitat. Most wildlife would vacate the operation areas and return upon reestablishment of vegetation. Direct impacts from mortality to smaller, less-mobile species could occur during operations if those species were present, although this mortality would be individualized and would not measurably affect population stability. Direct impacts to non-sensitive wildlife populations would be ***moderate, negative, local,*** and ***short term*** *(**Biology Impact-3b**)*.

Bioaccumulative chemicals, such as mercury and polychlorinated biphenyls (PCBs), currently present onsite could result in species mortality, reproductive impairment, and developmental effects (Freshman and Menzie, 1996). Wildlife species might acquire toxic substances from the environment, along with nutrients and water. Some contaminants are metabolized or excreted, but others accumulate in specific tissues. Bioaccumulated toxins become more concentrated in successive levels in the food web (large amounts of contaminated biomass are consumed by herbivores, which then would be consumed by carnivores). Thus, top-level carnivores, such as snakes or coyotes, are most severely affected by contaminants. The removal of non-treatable soils would have a ***minor, beneficial, regional,*** and ***long-term*** effect on wildlife species by reducing the potential for contaminant exposure or bioaccumulation *(**Biology Impact-3c**).*

**Sensitive Species**

Specific impacts to USFWS- and CDFW-listed species from all cleanup efforts are identified in Section 4.4.1.1. If a species listed as threatened or endangered by the USFWS were harmed during cleanup, it would be a ***significant, negative, regional,*** and ***long-term*** impact *(**Biology Impact-1i**)*. NASA worked with the USFWS to develop appropriate mitigation to lessen this impact. Impacts to CDFW-listed species depend on the number of organisms harmed during cleanup activities and the impact to the species populations. These impacts range from ***minor, negative, local,*** and ***long term*** *(**Biology Impact-1j**)* to ***moderate, negative, local*****,** and ***short term*** *(**Biology Impact-1k**).*

**Migration Linkages**

The NASA-administered portions of SSFL are adjacent to a potential migration corridor for numerous wildlife species (South Coast Wildlands, 2008). If migrating species are present during cleanup activities, the impacts would be similar to **Biology Impact-3b.**

**Migratory Birds**

Birds usually can escape harm during demolition and cleanup activities by flying away; but during the nesting season (February 1 through August 15), eggs and chicks would be at risk. The potential for disturbance or mortality of migratory birds during excavation activities would result in a ***moderate, negative, regional,*** and ***short-term*** impact *(**Biology Impact-4b**).*

**Species with Native American Cultural Uses**

A search was conducted to evaluate the distribution and status of plants and animals identified as species used by Native Americans. None of the species listed in Table 3.4-4 has been identified by the USFWS, CDFW, or CNPS as a species of concern, and the distribution of these species extends beyond the SSFL boundaries (USDA, 2013; Baldwin, et al., 2012; NatureServe, 2013). Consequently, it is appropriate to assume that these species populations currently are stable and that cleanup activities would have a ***negligible, negative, local,*** and ***short-term*** impact ***(Biology Impact-5b)*** on population stability of these species.

Nonetheless, excavation of 105 acres of up to 20 ft of soil would result in the removal of all plants and seeds in the area of the soil removal. Efforts might be made to use less invasive excavation methods around large trees such as oaks; however, it is unlikely this method would achieve the Look-Up Table values required by the 2010 AOC. Cultural impacts are discussed further in Section 4.3.

**Wetlands**

Excavation of soils for cleanup purposes could affect approximately 2 acres of the total 3.20 acres of wetlands identified within the ROI (1.30 acres of perennial ponds and swales and 1.90 acres of drainages) (NASA, 2012b). The U.S. Army Corps of Engineers (USACE) has determined these areas to be waters of the U.S. and subject to Clean Water Act (CWA) Section 404 and Section 401 permitting (USACE, 2013). Expected impacts to wetlands would be ***moderate, negative, regional,*** and ***long term (Biology Impact-6a)***. However, NASA would work with the USACE during the permitting process to mitigate the disturbance to waters of the U.S.

***Excavation and Offsite Disposal with Ex Situ Onsite Treatment***

**Natural Vegetation Community**

Ex situ treatments for the remaining treatable soils would require further excavation to greater depths equating to more than180,000 $yd^3$ of additional soil that would be removed and treated elsewhere onsite and redistributed around the site. Thermal desorption would kill organics, including seed stock or microorganisms. Soil washing might remove seeds, and land farming most likely would not remove seeds. The incremental impact from further excavation below 2 ft could require the removal of large trees that might have been saved during soil excavation of the first 2 ft of soil. Additionally, deeper excavation could change the character of many drainages and the overall landscape, removing deeper soils that might be needed for some species regrowth. Although soil would be returned in these areas, the impact of the excavation for treatment would result in a ***significant, negative, regional,*** and ***long-term*** impact on native vegetation ***(Biology Impact-2g)***.

Ex situ treatments rely on moving treatable soils from one location to another for processing. This process could increase the spread of invasive and noxious weed species by transporting weeds around the site and redistributing them, as well as by mixing seeds previously buried and bringing them up to the surface. Weed species could out-compete native species in areas where soils had been exposed and weed species could become dominant in areas previously suitable only for locally adapted plants. In addition, weed species could out-compete native plants in areas where a soil remediation technology (such as land farming) added nutrients to the soils. Removal of native vegetation during excavation for ex situ approaches could induce the spread of noxious weeds, which could lead to a ***significant, negative, regional,*** and ***long-term*** impact on native vegetation and wildlife ***(Biology Impact-2h)***.

**Wildlife**

Excavation for ex situ cleanup technologies removes vegetation, further imposes physical barriers, and intimidates wildlife through noise, human presence, and loss of habitat. Most wildlife would vacate the operation areas and return once vegetation had been reestablished. Direct impacts from mortality to smaller, less-mobile species could occur during operations if those species were present, although this mortality would be individualized and would not measurably affect population stability. Similar to excavation and offsite disposal, the incremental direct impacts to non-sensitive wildlife populations would remain ***moderate, negative, local,*** and ***short term (Biology Impact-3d)***.

The majority of treatable soils requiring this type of cleanup technology is more than 2 ft deep and are organic compounds. Removal of the non-treatable soils covering these layers would expose the formerly buried treatable soils to wildlife, but these exposed soil areas would be fenced or otherwise managed to avoid exposure to wildlife. The beneficial impacts of the incremental excavation of treatable soils, because of the reduction in soil contamination, would be ***minor, beneficial, local,*** and ***long term (Biology Impact-3e)***.

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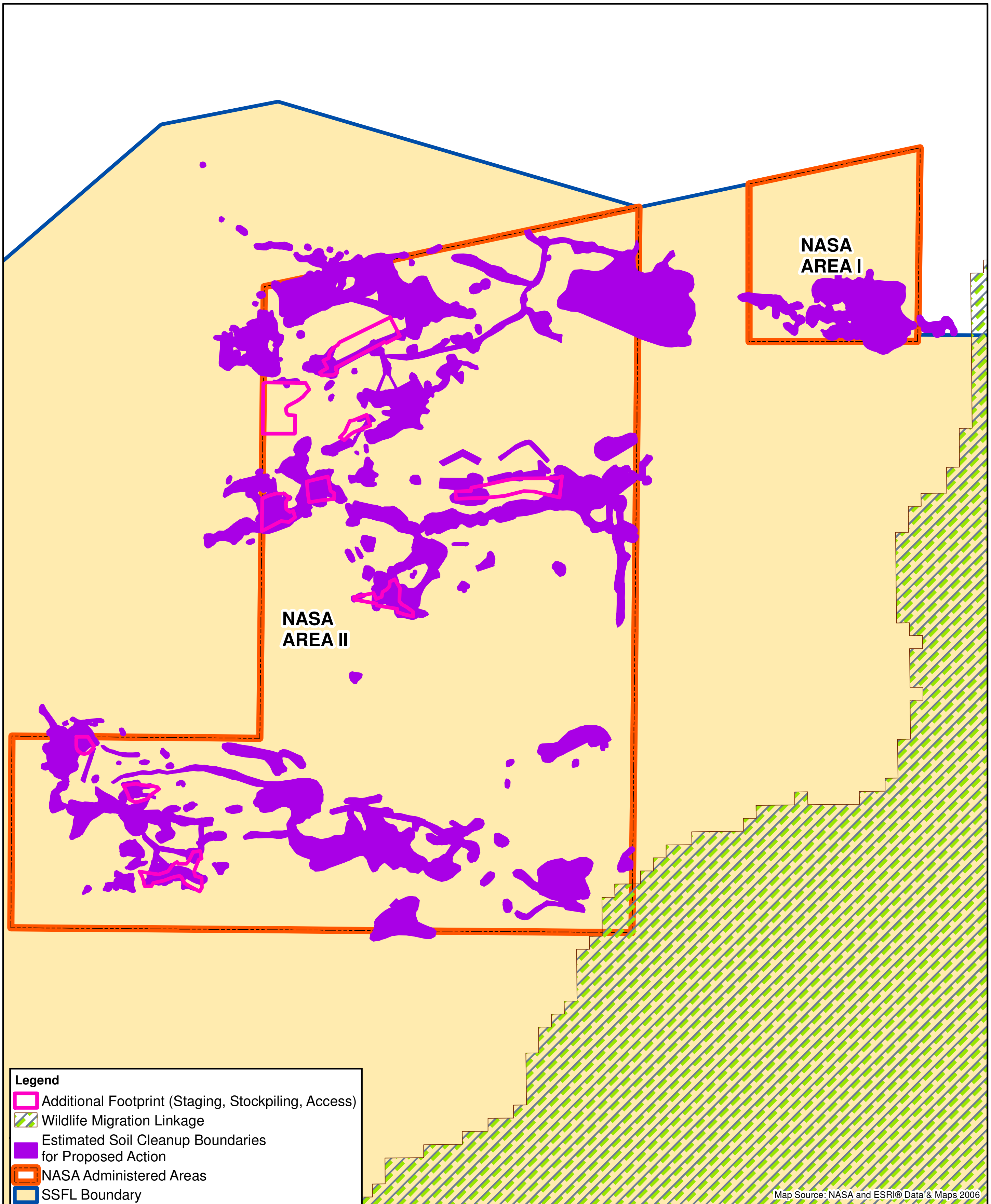


**Figure 4.4-2**
**Wildlife Migration Linkage Location**
**NASA - Santa Susana Field Laboratory**
**EIS for Proposed Demolition and Environmental Cleanup**

Map Document: O:\NASA\SSFL\maps\EIS_2011\Migratory_Corridor_BackgroundCleanup.mxd

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**Sensitive Species**

Specific impacts to USFWS- and CDFW-listed species from all cleanup efforts are identified in Section 4.4.1.1. If a species listed as threatened or endangered by the USFWS were harmed during cleanup, it would be a ***significant, negative, regional*** and ***long-term*** impact ***(Biology Impact-1l)***. NASA worked with the USFWS to develop appropriate mitigation to lessen this impact. Impacts to CDFW-listed species depend on the number of organisms harmed during cleanup activities and the impact to the species populations. These impacts range from ***minor, negative, local,*** and ***long term (Biology Impact-1m)*** to ***moderate, negative, local,*** and ***short term (Biology Impact-1n)***.

**Migration Linkages**

The NASA-administered portions of SSFL are adjacent to a potential migration corridor for numerous wildlife species (South Coast Wildlands, 2008). If migrating species are present during cleanup activities, the impacts would be similar to **Biology Impact-3d.**

**Migratory Birds**

Similar to excavation for offsite disposal, the excavation of treatable soils has the potential for disturbance or mortality of migratory birds during excavation activities and would result in a ***moderate, negative, regional,*** and ***short-term*** impact ***(Biology Impact-4c)*** if they were to occur during nesting periods.

**Species with Native American Cultural Uses**

A search was conducted to evaluate the distribution and status of plants and animals identified as species used by Native Americans. None of the species listed in Table 3.4-4 has been identified by the USFWS, CDFW, or CNPS as a species of concern, and the distribution of these species extends beyond the SSFL boundaries (USDA, 2013; Baldwin, et al., 2012; NatureServe, 2013). Consequently, it is appropriate to assume that these species populations currently are stable, and cleanup activities would have a ***negligible, negative, local,*** and ***short-term*** impact ***(Biology Impact-5c)*** on the population stability of these species.

Nonetheless, excavation of 105 acres to up 20 ft of soil would result in the removal of all plants and seeds in the area of the soil removal. Efforts could be made to use less invasive excavation methods around large trees such as oaks; however, it is unlikely that this method would achieve the Look-Up Table values required by the 2010 AOC. Cultural impacts are discussed further in Section 4.3.

**Wetlands**

Excavation of soils for cleanup purposes could affect approximately 2 acres of the total 3.20 acres of wetlands identified within the ROI (1.30 acres of perennial ponds and swales and 1.90 acres of drainages) (NASA, 2012b). USACE has determined these areas to be waters of the U.S. and subject CWA Section 404 and Section 401 permitting (USACE, 2013). Expected impacts to wetlands would be ***moderate, negative, regional***, and ***long term (Biology Impact-6b)***; however, NASA would work with the USACE during the permitting process to mitigate the disturbance to waters of the U.S.

***Excavation and Offsite Disposal with In Situ Onsite Treatment***

**Native Vegetation Communities**

Some native vegetation would be removed to construct and operate wells and for the staging of tanks, piping, and equipment for in situ treatments such as SVE, anaerobic or aerobic biological treatment, and chemical oxidation, but impacts would occur on a much smaller scale than soil removal efforts. The impact on areas that would be suitable for wells near and around contaminated soils that were not excavated previously (outside of the 105-acre footprint) would be ***moderate, negative, local***, and ***short term (Biology Impact-2i)***, because the wells likely would be removed within 5 years and the vegetation could easily regrow.

Construction and operation of wells could encourage weed growth. Impacts in areas where wells might be needed outside disturbed soil areas would be ***moderate, negative, local,*** and ***long term (Biology Impact-2j).***

#### Wildlife

Construction of in situ cleanup technologies would have some impact on wildlife through noise, human presence, and some loss of habitat. Most wildlife would vacate the construction areas and return once human activity in the area declined. The impacts in areas that previously were undisturbed would be short lived and would be ***moderate, negative, local,*** and ***short term (Biology Impact-3f)***. The beneficial impacts of in situ soil treatment due to the reduction in soil contamination would be ***minor, beneficial, local,*** and ***long term (Biology Impact-3g)***.

#### Sensitive Species

Specific impacts to USFWS- and CDFW-listed species from the cleanup efforts are identified in Section 4.4.1.1. If a species listed as threatened or endangered by the USFWS were harmed during cleanup, it would be a ***significant, negative, regional,*** and ***long-term*** impact ***(Biology Impact-1o)***. NASA worked with the USFWS to develop appropriate mitigation to lessen such impacts. Impacts to CDFW-listed species would depend on the number of organisms harmed during cleanup activities and the impact to the species populations. These impacts would range from ***minor, negative, local,*** and ***long term (Biology Impact-1p)*** to ***moderate, negative, local,*** and ***short term (Biology Impact-1q)***.

#### Migration Linkages

The NASA-administered portions of SSFL are adjacent to a potential migration corridor for numerous wildlife species (South Coast Wildlands, 2008). If migrating species are present during cleanup activities, the impacts would be similar to **Biology Impact-3f.**

#### Migratory Birds

The impacts of in situ treatment would be ***negligible, negative, regional,*** and ***short term (Biology Impact-4d),*** because wells could be located to avoid nests, if found, and installation would be short lived.

#### Species with Native American Cultural Uses

The impact of in situ treatment on species with Native American cultural uses would be ***negligible, negative, local,*** and ***short term (Biology Impact-5d),*** due to the relatively small area of disturbance and the stability of current populations.

#### Wetlands

There are ***no impacts*** to wetlands for in situ treatments, because equipment and wells would not be located in wetlands.

#### *Monitored Natural Attenuation*

MNA does not use any specific equipment other than monitoring equipment. MNA would be applied after the remediation of non-treatable soils, and it would take many years to reach the cleanup levels. It should have ***no impact*** on biological resources at SSFL.

### 4.4.1.4 Groundwater Cleanup

All of the groundwater remediation technologies other than MNA would require the installation of equipment such as wells and boreholes installed using mechanical drilling methods. Additional equipment and piping would remain above ground. Groundwater remediation would remove topsoil in areas outside the soil cleanup footprints in order to construct access road for well drilling and pipeline installation. The access pathway could be cleared and gravel or other base material used as fill material. The pathways would vary in width and depth according to the remedial technology selected and pipeline sizes and design.

#### Native Vegetation Communities

Changes in groundwater and surface water availability could result from groundwater and soil remediation activities. In general, however, plants around SSFL are adapted to drought and repeated fire conditions and would survive changes in groundwater availability, although some changes in species composition might occur. Changes in water availability could have ***minor, negative, local,*** and ***long-term*** impacts ***(Biology Impact-2k)*** on native vegetative communities.

Additionally, the installation of injection and monitoring wells, staging of chemical tanks, associated piping, and other equipment required for this technology could cause disturbance to vegetation, resulting in ***minor, negative, local,*** and ***long-term*** impacts ***(Biology Impact-2k)***.

There is also some potential for an increase in the spread of invasive and noxious weed species, which could out-compete native species, but it would be in limited areas. The impacts for these groundwater technologies on the spread of invasive species would be ***minor, negative, local,*** and ***long term*** on native vegetation and wildlife ***(Biology Impact-2l).***

**Wildlife, Migration Linkages, and Migratory Birds**

Groundwater remediation primarily would affect organisms existing at the subsurface and in groundwater. Only microorganisms such as viruses, bacteria, and fungi typically live in groundwater. Few multi-cell organisms other than insects and earthworms exist below ground. Because of their natural abundance, the impacts to these organisms from groundwater remediation would be ***negligible, negative, local,*** and ***short term (Biology Impact-3h).***

There would be some minor disruptions to wildlife in the vicinity of the installation of additional wells for groundwater treatment. However, the wells would be located far apart, thereby limiting disturbance to the local vicinity of each well during their installation and avoiding nesting areas. The impacts to wildlife and migratory birds would be ***minor, negative, local,*** and ***short term (Biology Impacts-3i).***

If migrating species are present during cleanup activities, the impacts would be similar to **Biology Impact-3i.**

**Sensitive Species**

Specific impacts to USFWS- and CDFW-listed species from all cleanup efforts are identified in Section 4.4.1.1. If a species listed as threatened or endangered by the USFWS were harmed during groundwater remediation, it would be a ***significant, negative, regional,*** and ***long-term*** impact ***(Biology Impact-1r)***. NASA worked with the USFWS to develop appropriate mitigation to lessen this impact. Impacts to CDFW-listed species depend on the number of organisms harmed during cleanup activities and the impact to the species populations. The impacts to CDFW-listed species from groundwater remediation would be ***negligible, negative, local,*** and ***short term (Biology Impact-1s).***

**Species with Native American Cultural Uses**

The installation of additional wells would result in the few impacts to species typically used by Native Americans and trees would be avoided; consequently, the impacts would be ***negligible, negative, local,*** and ***short term (Biology Impact-5e.)***

**Wetlands**

Wells would not be located in wetlands; consequently, there would be ***no impact*****.**

### 4.4.2 Best Management Practices and Mitigation Measures

This subsection provides a brief description of impacts previously discussed in detail, along with corresponding mitigation measures and BMPs. BMPs are defined as actions required by law or an industry standard included in the Proposed Action activities. Mitigation is an action that would benefit the environment, but must be agreed to by agency stakeholders and NASA. Agreed-upon mitigation measures would be provided in the ROD. These impacts, BMPs, and mitigation measures are numbered to correspond to the impact summary table provided in Section 4.4.4.

***Biology BMP-1*****:** Given the range and diverse nature of habitats that might be disturbed, a range of restorations would be needed. In soil remediation areas, it is anticipated one third of the excavated material would be replaced with clean back fill topsoil. Exposed soils are susceptible to wind and water erosion; thus, revegetation would be the preferred method to mitigate soil disturbance. However, it is only a viable option when top soil is present, because subsoil lacks the physical composition and necessary nutrients to support plant life. When topsoil was available, the area would be reseeded using drill, broadcast, or hydro seeding techniques, depending on the slope or remoteness of the disturbed area. The site would be reseeded using an approved native seed mix developed for The Boeing Company (Boeing) property, which is commercially available. This approved native seed mix was developed to expedite native plant establishment and to reduce erosion; consequently, it does not contain the same composition of plants currently onsite and would result in a change in plant composition on the reseeded sites. NASA may also plant shrubs and trees depending on the final contours and soil cover.

It can take many years for native species to reestablish in disturbed areas and the species composition would be different then what was originally there, despite reseeding with the approved native seed mix. The restoration goal would be 50 percent native plant cover, 3 years after disturbance for grass and herbaceous species, though it may take much longer for shrub and tree species. Despite an improvement to the native vegetation communities, the natural communities likely will never return as they currently occur, and the overall impacts after implementation of this BMP would remain ***significant, negative, local,*** and ***long term*** *(****Biology Impact-2a, d, e, g, i,*** and ***k,****).*

***Biology BMP-2:*** In conjunction with reseeding and when topsoil was unavailable, soil stabilization BMPs would be used including soil binders, erosion mats, gabion walls, and erosion control check dams. Soil amendments also would be used to help in the reseeding success. Appropriate restoration measures would be prescribed based on the site location, slope, and remoteness.

Furthermore, per ***Water BMP-1*** (discussed in Section 4.6.2), an SWPPP and an Erosion Control Plan (ECP) would be updated and implemented to guide erosion control methodology. Per ***Air Quality Mitigation Measure-3*** (discussed in Section 4.7.2), a project Dust Control Plan would be developed to prevent soil erosion. Although these mitigation measures would reduce the ultimate impact to vegetation onsite, the overall impacts to native vegetation would remain ***significant, negative, local,*** and ***long term (Biology Impact-2a, d, e, g, i,*** and ***k****).*

***Biology BMP-3****:* Once groundwater remediation reached the desired level, wells would be removed and the area would be reseeded with an approved native seed mix. However, the overall impacts to native vegetation would remain ***minor, negative, local,*** and ***long term (Biology Impact-1k****).*

***Biology BMP-4****:* Individuals working on cleanup and demolition activities would be trained to identify federal- and state-listed species. If a listed species were observed during operations, operations would halt and a qualified wildlife biologist would be called to the site. If the species were validated as a listed species, the USFWS or CDFW would be consulted. These actions would lessen the potential impacts to listed species; however, any impact to a USFWS threatened or endangered species would still be considered ***significant, negative, regional,*** and ***long term (Biology Impact-1b, c, d, e, f, h, i, k, l, n, o, q, r, s).*** The impacts to CDFW species would remain the same.

***Biology BMP-5:*** NASA would obtain a CWA Section 404 Permit from the USACE and a CWA Section 401 permit from the Regional Water Quality Control Board (RWQCB) for the discharge or dredge of material into jurisdictional waters of the U.S. ***(Biology Impact-6a*** and ***b).*** The Section 404 and 401 permits would include necessary measures to avoid, minimize, or otherwise mitigate impacts to wetlands and other waters of the U.S.

***Biology Mitigation Measure-1***: If the cleanup can be done in a manner compliant with the 2010 AOC, the soil would be removed with pick axes, shovels, or a vacuum truck in areas where sensitive resources occur, including CDFW-sensitive habitats and large oak trees. When possible, the least detrimental remediation technologies would be used in sensitive resource areas. This approach would reduce the impacts to ***moderate, negative, local,*** and ***short term (Biology Impact-2e).***

***Biology Mitigation Measure-2*****:** NASA would avoid the Santa Susana tarplant to the extent possible. Individuals working on cleanup and demolition activities would be trained to identify the Santa Susana tarplant and avoid it; however, Santa Susana tarplant populations still could be disturbed or killed if they were located on an identified soil cleanup, demolition, or mitigation site. This avoidance, where possible, would reduce the overall impact to ***minor, negative, local*** and ***short term*** (***Biology Impact-1a, g, j, m,*** and ***p***).

***Biology Mitigation Measure-3****:* NASA would implement a weed management plan to eradicate noxious and invasive species as they appeared on sites using federally approved methodologies. However, even with proper weed management, the current vegetation composition of the area likely will never return and the likeliest outcome is that the area will become dominated by non-native annual grasslands or other non-native herbaceous weeds. This mitigation would reduce impacts from weeds to ***moderate, negative, local,*** and ***short term** (**Biology Impact 2a, c, d, f, g, h, i, j, k,*** and ***l).***

***Biology Mitigation Measure-4:*** Project sites would be surveyed for the presence of migratory bird nests by a qualified biologist prior to work commencing. NASA is consulting with USFWS to establish appropriate mitigation to protect migratory birds present during cleanup operations. Such mitigation may include nest avoidance, schedule activities outside nesting seasons, relocation, or compensatory mitigation. This mitigation would reduce the impacts to a ***minor, negative, regional,*** and ***short-term*** impact *(**Biology Impact-4a, b, c,** and **d**)*.

***Biology Mitigation Measure-5:*** The following mitigation measures were identified by the USFWS to mitigate potential impacts to federally threatened or endangered listed species (USFWS, 2013b). Prior to any construction activities, NASA will conduct protocol-level surveys in all suitable habitats for Braunton's milk-vetch, California red-legged frog, Least Bell's vireo, Riverside fairy shrimp, and vernal pool fairy shrimp. If a federally listed species is identified, activities will halt and NASA will initiate formal consultation with the USFWS, during which time additional mitigation measures will be developed. Further additional dialogue will occur with the USFWS if rock basins are impacted by the Proposed Action. Where rock basins occur near construction areas, exclusion fencing will be set up. Based on the actions described here, there are ***no expected impacts*** to any federally listed species *(**Biology Impact-1b and f**).*

## 4.4.3 No Action Alternative

### 4.4.3.1 Vegetation

Under the No Action Alternative, native vegetation, sensitive habitats, and listed species would not be disturbed because of demolition or cleanup activities. However, these resources would continue to be disturbed as a result of ongoing NASA activities, including ISRA cleanup, GETS, sampling activities, and general maintenance activities. These impacts would be considered ***negligible, negative, local,*** and ***short term***. Likewise, the effect of noxious weeds on natural communities would continue, remaining a ***minor, negative, regional,*** and ***long-term*** impact.

### 4.4.3.2 Wildlife

Wildlife species, migratory birds, and listed species would be disturbed only as ongoing remediation and sampling at SSFL were being implemented. These impacts would be ***minor, negative, local,*** and ***short term****.* Bioaccumulative chemicals, which are present on SSFL, could result in species mortality, reproductive impairment, and developmental effects (Freshman and Menzie, 1996). As detailed in Table 3.9-1, the ecological risk-based scenaro indicates that some actions are required to b e protective of wildlife. Continued long-term exposure of wildlife to the soil, groundwater, and surface water contamination could have a ***negligible, negative, regional*****,** and ***long-term*** impact on species' composition and reproduction.

### 4.4.3.3 Wetlands

***Minor, negative, local,*** and ***short-term*** impacts would be expected to wetlands during ongoing operations at SSFL.

## 4.4.4 Summary of Impacts, Best Management Practices, and Mitigation Measures

Table 4.4-1 provides a summary of the impacts on biological resources, as described in this subsection. Impact, BMP, and mitigation measure numbering correspond to Table 4.4-1. The specific mitigation and corresponding impact are provided, followed by a resulting impact level if mitigation were applied successfully. Table 4.4-1 concludes with an overall impact level, based on the highest level of impact identified in the analysis.

TABLE 4.4-1
**Summary of Biological Resources Impacts, Best Management Practices, and Mitigation Measures**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Impacts[a] | Project Alternatives[a] | | Best Management Practices and Mitigation Measures[a] | Impact After Best Management Practices and Mitigation Measures Implementation[a] |
|---|---|---|---|---|
| | Proposed Action | No Action | | |
| Biology-1a: Impacts to Santa Susana tarplant | Moderate, negative, local, long term ◉ | Negligible, negative, local, short term ○ | Biology MM-2 | Negligible to minor, negative, local, long term ○ |
| Biology-1b: Impacts to California red legged frog | Significant, negative, regional, long term ● | Minor, negative, local, short term ⭘ | Biology BMP-4<br>Biology MM-5 | No expected impact |
| Biology-1c: Impacts to coast horned lizard | Minor, negative, local, short term ⭘ | Minor, negative, local, short term ⭘ | Biology BMP-4 | Minor, negative, local, short term ⭘ |
| Biology-1d: Impacts to two-striped garter snake | Minor, negative, local, short term ⭘ | Minor, negative, local, short term ⭘ | Biology BMP-4 | Minor, negative, local, short term ⭘ |
| Biology-1e: Impacts to loggerhead shrike | Minor, negative, local, short term ⭘ | Minor, negative, local, short term ⭘ | Biology BMP-4 | Minor, negative, local, short term ⭘ |
| Biology-1f: Impacts to USFWS-listed species from demolition activities | Significant, negative, regional and long term ● | Minor, negative, local, short term ⭘ | Biology BMP-4 | No expected impact |
| Biology-1g: Impacts to Santa Susana tarplant from demolition activities | Minor, negative, local, long term ⭘ | Negligible, negative, local, short term ○ | Biology MM-2 | Negligible to minor, negative, local, long term ⭘ |
| Biology-1h: Impacts to CDFW-listed species from demolition activities | Moderate, negative, local, short term ◉ | Minor, negative, local, short term ⭘ | Biology BMP-4 | Moderate, negative, local, short term ◉ |

TABLE 4.4-1
**Summary of Biological Resources Impacts, Best Management Practices, and Mitigation Measures**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Impacts[a] | Project Alternatives[a] | | Best Management Practices and Mitigation Measures[a] | Impact After Best Management Practices and Mitigation Measures Implementation[a] |
|---|---|---|---|---|
| | Proposed Action | No Action | | |
| Biology-1i: Impacts to USFWS-listed species from excavation activities | Significant, negative, regional and long term<br>● | Minor, negative, local, short term<br>○ | Biology BMP-4 | No expected impact |
| Biology-1j: Impacts to Santa Susana tarplant from excavation activities | Minor, negative, local, long term<br>○ | Negligible, negative, local, short term<br>◦ | Biology MM-2 | Negligible to minor, negative, local, long term<br>○ |
| Biology-1k: Impacts to CDFW-listed species from excavation activities | Moderate, negative, local, short term<br>◉ | Minor, negative, local, short term<br>○ | Biology BMP-4 | Moderate, negative, local, short term<br>◉ |
| Biology-1l: Impacts to USFWS-listed species from ex situ activities | Significant, negative, regional and long term<br>● | Minor, negative, local, short term<br>○ | Biology BMP-4 | No expected impact |
| Biology-1m: Impacts to Santa Susana tarplant from ex situ activities | Minor, negative, local, long term<br>○ | Negligible, negative, local, short term<br>◦ | Biology MM-2 | Negligible to minor, negative, local, long term<br>○ |
| Biology-1n: Impacts to CDFW-listed species from ex situ activities | Moderate, negative, local, short term<br>◉ | Minor, negative, local, short term<br>○ | Biology BMP-4 | Moderate, negative, local, short term<br>◉ |
| Biology-1o: Impacts to USFWS-listed species from in situ activities | Significant, negative, regional, long term<br>● | Minor, negative, local, short term<br>○ | Biology BMP-4 | No expected impact |
| Biology-1p: Impacts to Santa Susana tarplant from in situ activities | Minor, negative, local, long term<br>○ | Negligible, negative, local, short term<br>◦ | Biology MM-2 | Negligible to minor, negative, local, long term<br>○ |

TABLE 4.4-1
**Summary of Biological Resources Impacts, Best Management Practices, and Mitigation Measures**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Impacts[a] | Project Alternatives[a] | | Best Management Practices and Mitigation Measures[a] | Impact After Best Management Practices and Mitigation Measures Implementation[a] |
|---|---|---|---|---|
| | Proposed Action | No Action | | |
| Biology-1q: Impacts to CDFW-listed species from In situ activities | Moderate, negative, local, short term<br>⊙ | Minor, negative, local, short term<br>⊙ | Biology BMP-4 | Moderate, negative, local, short term<br>⊙ |
| Biology-1r: impacts to USFWS-listed species from groundwater activities | Significant, negative, regional, long term<br>● | Minor, negative, local, short term<br>⊙ | Biology BMP-4 | No expected impact |
| Biology-1s: Impacts to CDFW-listed species from groundwater activities | Negligible, negative, local, short term<br>○ | Minor, negative, local, short term<br>⊙ | Biology BMP-4 | Negligible, negative, local, short term<br>○ |
| Biology-2a: Impacts to native vegetation from demolition activities | Minor, negative, local, long term<br>⊙ | Negligible, negative, local, short term<br>○ | Biology BMP-1<br>Biology BMP-2<br>Biology MM-3<br>Water BMP-1<br>Air Quality MM-3 | Minor, negative, long, short term<br>⊙ |
| Biology-2b: Impacts due to increased undeveloped area from demolition activities | Minor, beneficial, local, long term<br>▣ | Negligible, negative, local, short term<br>○ | None | N/A |
| Biology-2c: Impacts due to the increased weed potential from demolition activities | Moderate, negative, regional, long term<br>⊙ | Minor, negative, regional, long term<br>⊙ | Biology MM-3 | Minor, negative, local, short term<br>⊙ |
| Biology-2d: Impacts to native vegetation from excavation activities | Significant, negative, local, long term<br>● | Negligible, negative, local, short term<br>○ | Biology BMP-1<br>Biology BMP-2<br>Biology MM-3<br>Water BMP-1<br>Air Quality MM-3 | Significant, negative, local, long term<br>● |

TABLE 4.4-1
**Summary of Biological Resources Impacts, Best Management Practices, and Mitigation Measures**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Impacts[a] | Project Alternatives[a] | | Best Management Practices and Mitigation Measures[a] | Impact After Best Management Practices and Mitigation Measures Implementation[a] |
|---|---|---|---|---|
| | Proposed Action | No Action | | |
| Biology-2e: Impacts to high priority conservation areas from excavation activities | Significant, negative, local, long term<br>● | Negligible, negative, local, short term<br>○ | Biology BMP-1<br>Biology BMP-2<br>Biology MM-1<br>Water BMP-1<br>Air Quality MM-3 | Moderate, negative, local, long term<br>● |
| Biology-2f: Impacts due to the increased weed potential from excavation activities | Significant, negative, regional, long term<br>● | Minor, negative, regional, long term<br>◯ | Biology MM-3 | Moderate, negative, local, short term<br>◯ |
| Biology-2g: Impacts to native vegetation from ex situ activities | Significant, negative, regional, long term<br>● | Negligible, negative, local, short term<br>○ | Biology BMP-1<br>Biology BMP-2<br>Biology MM-3<br>Water BMP-1<br>Air Quality MM-3 | Significant, negative, regional, long term<br>● |
| Biology-2h: Impacts due to the increased weed potential from ex situ activities | Significant, negative, regional, long term<br>● | Minor, negative, regional, long term<br>◯ | Biology MM-3 | Minor, negative, local, short term<br>◯ |
| Biology-2i: Impacts to native vegetation from in situ activities | Moderate, negative, local, short term<br>◉ | Negligible, negative, local, short term<br>○ | Biology BMP-1<br>Biology BMP-2<br>Biology MM-3<br>Water BMP-1<br>Air Quality MM-3 | Moderate, negative, local, short term<br>◉ |

TABLE 4.4-1
**Summary of Biological Resources Impacts, Best Management Practices, and Mitigation Measures**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Impacts[a] | Project Alternatives[a] | | Best Management Practices and Mitigation Measures[a] | Impact After Best Management Practices and Mitigation Measures Implementation[a] |
|---|---|---|---|---|
| | Proposed Action | No Action | | |
| Biology-2j: Impacts due to the increased weed potential from in situ activities | Moderate, negative, local, long term | Minor, negative, regional, long term | Biology MM-3 | Minor, negative, local, short term |
| Biology-2k: Impacts to native vegetation from groundwater activities | Minor, negative, local, long term | Negligible, negative, local, short term | Biology BMP-1<br>Biology BMP-2<br>Biology BMP-3<br>Biology MM-3<br>Water BMP-1<br>Air Quality MM-3 | Minor, negative, local, long term |
| Biology-2l: Impacts due to the increased weed potential from ground water activities | Minor, negative, local, long term | Minor, negative, regional, long term | Biology MM-3 | Minor, negative, local, short term |
| Biology-3a: Impacts to wildlife from demolition activities | Minor, negative, local, short term | Minor, negative, local, short term | None | N/A |
| Biology-3b: Impacts to wildlife from excavation activities | Moderate, negative, local, short term | Minor, negative, local, short term | None | N/A |
| Biology-3c: Impacts to wildlife from reduction of contamination due to excavation activities | Minor, beneficial, regional, long term | Negligible, negative, regional, short term | None | N/A |
| Biology-3d: Impacts to wildlife from ex situ activities | Moderate, negative, local, short term | Minor, negative, local, short term | None | N/A |
| Biology-3e: Impacts to wildlife from reduction of contamination due to ex situ activities | Minor, beneficial, local, long term | Negligible, negative, regional, short term | None | N/A |

TABLE 4.4-1
**Summary of Biological Resources Impacts, Best Management Practices, and Mitigation Measures**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Impacts[a] | Project Alternatives[a] | | Best Management Practices and Mitigation Measures[a] | Impact After Best Management Practices and Mitigation Measures Implementation[a] |
|---|---|---|---|---|
| | Proposed Action | No Action | | |
| Biology-3f: Impacts to wildlife from in situ activities | Moderate, negative, local, short term ◉ | Minor, negative, local, short term ⭘ | None | N/A |
| Biology-3g: Impacts to wildlife from reduction of contamination due to In situ activities | Minor, beneficial, local, long term ▣ | Negligible, negative, regional, short term ○ | None | N/A |
| Biology-3h: Impacts to subsurface organisms | Negligible, negative, local, short term ○ | No Impact ▽ | None | N/A |
| Biology-3i: Impacts to wildlife from In groundwater activities | Minor, negative, local, short term ⭘ | Minor, negative, local, short term ⭘ | None | N/A |
| Biology-4a: Impacts to migratory birds from demolition activities | Moderate, negative, regional, short term ◉ | Minor, negative, local, short term ⭘ | Biology MM-4 | Minor, negative, local, short term ⭘ |
| Biology-4b: Impacts to migratory birds from excavation activities | Moderate, negative, regional, short term ◉ | Minor, negative, local, short term ⭘ | Biology MM-4 | Minor, negative, local, short term ⭘ |
| Biology-4c: Impacts to migratory birds from ex situ activities | Moderate, negative, regional, short term ◉ | Minor, negative, local, short term ⭘ | Biology MM-4 | Minor, negative, local, short term ⭘ |
| Biology-4d: Impacts to migratory birds from in situ activities | Negligible, negative, regional, short term ○ | Minor, negative, local, short term ⭘ | Biology MM-4 | Minor, negative, local, short term ⭘ |
| Biology-5a: Impacts to species with Native American cultural uses from demolition activities | Negligible, negative, local, short term ○ | Negligible, negative, local, short term ○ | None | N/A |

TABLE 4.4-1

**Summary of Biological Resources Impacts, Best Management Practices, and Mitigation Measures**

*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Impacts[a] | Project Alternatives[a] | | Best Management Practices and Mitigation Measures[a] | Impact After Best Management Practices and Mitigation Measures Implementation[a] |
|---|---|---|---|---|
| | Proposed Action | No Action | | |
| Biology-5b: Impacts to species with Native American cultural uses from excavation activities | Negligible, negative, local, short term ○ | Negligible, negative, local, short term ○ | None | N/A |
| Biology-5c: Impacts to species with Native American cultural uses from ex situ activities | Negligible, negative, local, short term ○ | Negligible, negative, local, short term ○ | None | N/A |
| Biology-5d: Impacts to species with Native American cultural uses from in situ activities | Negligible, negative, local, short term ○ | Negligible, negative, local, short term ○ | None | N/A |
| Biology-5e: Impacts to species with Native American cultural Uses from groundwater activities | Negligible, negative, local, short term ○ | Negligible, negative, local, short term ○ | None | N/A |
| Biology-6a: Impacts to wetlands from excavation activities | Moderate, negative, regional, long term ◉ | Minor, negative, local, short term ◉ | Biology BMP-5 | Dependent on USACE and RWQCB permit requirements[b] |
| Biology-6b: Impacts to wetlands from ex situ activities | Moderate, negative, regional, long term ◉ | Minor, negative, local, short term ◉ | Biology BMP-5 | Dependent on USACE and RWQCB permit requirements[b] |

TABLE 4.4-1
**Summary of Biological Resources Impacts, Best Management Practices, and Mitigation Measures**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Impacts[a] | Project Alternatives[a] | | Best Management Practices and Mitigation Measures[a] | Impact After Best Management Practices and Mitigation Measures Implementation[a] |
|---|---|---|---|---|
| | Proposed Action | No Action | | |
| **Overall Alternative Impacts** | Significant, negative, regional, long term<br>● | Negligible, negative, local, long term<br>○ | Biology-MM-1;<br>Biology-MM-2;<br>Biology-MM-3;<br>Biology- MM-4;<br>Biology-MM-5;<br>Biology BMP-1;<br>Biology-BMP-2;<br>Biology-BMP-3;<br>Biology-BMP-4;<br>Biology-BMP-5;<br>Water-BMP-1;<br>Air Quality-MM-3 | Significant, negative, regional, long term [b, c]<br>● |
| | Minor, beneficial, regional, long term<br>▣ | Minor, negative, regional, long term<br>⭘ | None | N/A |

Notes:
● or ■ = Significant
◉ or ▣ = Moderate
⭘ or ▣ = Minor
○ or ☐ = Negligible
▽ = No impact
Circular symbols represent negative impacts while square symbols represent beneficial impacts, and the degree to which the symbol is filled represents the severity of the impact.

BMP = best management practice
MM = mitigation measure

[a] This impact is the combined impact of all remediation technologies. Potential impacts, BMPs, and mitigation measures are discussed further in Sections 4.4.1 through 4.4.3.
[b] Mitigation is dependent on consultation with USACE for CWA Section 404 permit and RWQCB for CWA Section 401 permit.

# 4.5 Traffic and Transportation

This subsection provides a description of the potential impacts from implementing the Proposed Action and No Action Alternative on traffic and transportation within the ROI. For this evaluation, there would be a primary and secondary area of impact. The primary ROI would include local access routes to the project site in both Los Angeles and Ventura counties. For heavy vehicles, these routes include Woolsey Canyon Boulevard, Valley Circle Boulevard, Roscoe Boulevard, Topanga Canyon Boulevard (State Route [SR] 27), SR 118 and U.S.101, as well as roadways within SSFL. For construction worker vehicles, the local access routes include Plummer Street, Box Canyon Road, and Santa Susana Pass Road, in addition to the roadways identified for heavy vehicles. The secondary ROI area is defined as the regional access routes to the project site and potential dump or landfill sites for construction and hazardous wastes, including I-405, I-5, I-210, and SR 14.

The primary impacts on traffic and transportation would result from truck traffic along the haul routes accessing SSFL, and from onsite demolition, construction, and environmental cleanup activities. For demolition, the most conservative action to evaluate is 100 percent demolition. However, through the cultural resource consultation (Section 106 consultation), NASA is considering a reduced demolition that would allow for the preservation of six historically significant structures at the Alfa and Bravo Test Stand areas. The trip generation associated with up to 100 percent demolition was evaluated quantitatively to provide an upper bound analysis and the trip generation associated with the reduced demolition was evaluated qualitatively.

The remediation approach involving Excavation and Offsite Disposal would generate the largest volume of offsite truck traffic. NASA also is exploring options to treat a portion of the soil onsite. This approach potentially could result in an approximately 36 percent reduction in the volume of soil that would need to be hauled offsite (320,000 $yd^3$) of soil compared to 500,000 $yd^3$ of soil for 100 percent excavation and disposal), resulting in fewer total truck trips. Traffic related to the remaining remediation approaches, including the groundwater cleanup approaches, would be limited to trucks and equipment accessing SSFL and remaining onsite until work was complete, because offsite hauling would not be necessary.

Section 4.5.1 includes a summary of the impact analysis to the site traffic and transportation under the various soil and groundwater cleanup scenarios. Section 4.5.2 provides information about potential impacts and mitigation measures applicable to site traffic and transportation. Section 4.5.3 provides a discussion of the No Action Alternative. Section 4.5.4 includes a summary table of impacts and mitigation measures identified in the site traffic and transportation analysis. Impacts and mitigation measures are numbered to correspond with the summary table to indicate where impacts might occur and mitigation measures might offset those impacts.

The following descriptions identify the thresholds of impacts relevant to the traffic and transportation analysis:

| Impact | Description |
|---|---|
| No Impact | No impacts to traffic and transportation would be expected. |
| Negligible | Impacts to traffic and transportation would not be expected to be measurable, or would be measurable but would cause little, if any, change in traffic flow or roadway conditions. |
| Minor | Impacts to traffic and transportation would be measurable but within the capacity of the system to absorb the change. Impacts to road conditions would be slight but noticeable. |
| Moderate | Impacts to traffic and transportation would alter resource conditions appreciably. Impacts would be measurable but within the capacity of the system to absorb the change; or the impacts could be compensated for with mitigation and resources so that the impact would not be significant. |

| Impact | Description |
|---|---|
| Significant | Impacts to traffic and transportation would alter resource conditions beyond the capacity of the affected system to absorb the change and could be severe and long lasting without major mitigation. |
| Quality: | Beneficial–would have a positive effect on traffic flow, roadway conditions, transportation safety, or travel conditions.<br>Negative–would have an adverse effect on traffic flow, roadway conditions, transportation safety, or travel conditions. |
| Proximity: | Local–would occur within and along roads accessing the NASA-administered property at SSFL.<br>Regional–would occur outside the local roadway network. |
| Duration: | Short term–would occur only during the proposed demolition and immediate remediation period.<br>Long term–would continue beyond the proposed demolition and immediate remediation period. |

For the roadway operations analysis, an impact would occur if the Proposed Action or No Action Alternative caused roadway segment operations to change from an acceptable to unacceptable level of service (LOS) (Section 3.10 provides an explanation of the LOS). If a roadway segment operates at an unacceptable LOS with existing traffic volumes, an impact was defined to occur only if project vehicle volumes resulted in a worse LOS than under existing traffic volumes. Within the primary area, an acceptable LOS would depend on the agency that owns and maintains the facility, as summarized in Table 3.10-2. For Ventura County, an unacceptable LOS would be defined as worse than LOS C. For the California Department of Transportation (Caltrans), an unacceptable LOS would be defined as worse than LOS D. For the City of Los Angeles and for Los Angeles County, an unacceptable LOS would be defined as worse than LOS E. The traffic analysis focused on the ROI because the majority of the project trips would use these roadways.

NASA completed a qualitative evaluation of the potential effects from truck traffic exposure to school children, safety effects from the project-related truck trips, and potential effects to pavement conditions and parking.

**Project Trip Generation**

Truck and automobile trips for the proposed construction activities were estimated to evaluate impacts. To represent realistic upper bounds for the purpose of a conservative analysis:

- It was estimated that 3,660 truckloads of demolition debris would be transported offsite.
- It was estimated that 26,441 trucks would be needed to transport soil offsite. This was calculated by dividing the total volume of soil to be disposed (500,000 $yd^3$) by the average capacity of the trucks (19 $yd^3$). Should onsite treatment technologies prove effective, there would be a potential to reduce the volume of soil disposed to 320,000 $yd^3$, which would result in 16,842 trucks.
- It was estimated that 8,814 trucks would be needed for backfill hauling, which assumed one third of the total soil volume would be backfilled, and therefore, one third of the trucks would be required for backfilling activities. However, the quantity of backfill used would be dependent on the availability of clean soil. If clean soil is not available, the site would be left as is after excavation. Therefore, the estimated number of truck trips is based on a cconservative assumption that clean soil is available to allow backfilling. Should the volume of soil be reduced to 320,000 $yd^3$, 5,614 trucks would be required.
- For LOS calculations, the truck trips were converted to passenger car equivalents at a ratio of 2.5 passenger cars for each truck, consistent with the *Highway Capacity Manual* (Transportation Research Board, 2000) guidelines for rolling terrain.
- It was estimated that 34 construction workers would be needed for demolition and 15 construction workers would be needed for excavation and disposal activities. As a conservative analysis, it was assumed that none of the construction workers would carpool.

- Demolition activities were assumed to take approximately 150 days to complete and excavation and disposal activities were estimated to be completed in approximately 500 days.
- Consistent with current SSFL procedures, trucks would be dispatched to and from SSFL at a minimum of 5-minute intervals and would operate between 7 a.m. and 7 p.m.

**Project Traffic Distribution**

***Construction Workforce Trip Distribution***

Based on the regional street network, current travel patterns, regional population centers, and anticipated employee origins and destinations, it is anticipated that the construction workforce traffic would be distributed as follows:

- 25 percent would originate from Simi Valley and areas to the northwest.
- 10 percent would originate from Thousand Oaks and areas to the southwest.
- 35 percent would originate from Van Nuys, Burbank, and areas to the southeast.
- 30 percent would originate from Van Nuys, San Fernando, and areas to the northeast.

Workers accessing the project site from the northwest would travel eastbound on SR 118 to Santa Susanna Pass Road and then south toward Box Canyon Road and the project site. Workers would use Santa Susanna Pass Road, Box Canyon Road, Valley Circle Boulevard, and Woolsey Canyon Road to reach the project site. Workers accessing the project site from the northeast would travel westbound on SR 118 to Topanga Canyon Boulevard and then south toward the project site. Workers would use Topanga Canyon Boulevard, Plummer Street, Valley Circle Boulevard, and Woolsey Canyon Road to reach the project site. Workers accessing the project site from the southwest or southeast would travel eastbound or westbound on U.S. 101 to Topanga Canyon Boulevard and then north toward the project site. Workers would use Topanga Canyon Boulevard, Roscoe Boulevard, Valley Circle Boulevard, and Woolsey Canyon Road to reach the project site. It was assumed that workers would use the same routes in reverse when leaving the project site. Although workers could access the project site via other roads than those mentioned herein, such as Black Canyon Road, these routes are not discussed further because the number of workers using these routes is anticipated to be low.

***Truck Trip Distribution***

Inbound trucks during demolition and excavation and disposal activities would be coming from either SR 118 or U.S. 101. The origin of these trips would vary over the course of the construction period. In general and based on existing travel patterns, it was assumed that approximately 40 percent of the trucks would travel on SR 118 and 60 percent of the trucks would travel on U.S. 101. The truck traffic was assumed to be distributed as follows:

- 20 percent would originate from Simi Valley and areas to the northwest.
- 15 percent would originate from Thousand Oaks and areas to the southwest.
- 45 percent would originate from Van Nuys, Burbank, and areas to the southeast.
- 20 percent would originate from Van Nuys, San Fernando, and areas to the northeast.

From either SR 118 or U.S. 101, the trucks would exit to Topanga Canyon Boulevard and travel south or north to Roscoe Boulevard. The trucks would then head west on Roscoe Boulevard to Valley Circle Boulevard. From Valley Circle Boulevard, trucks would travel north to Woolsey Canyon Road and then west to the project site. It was assumed that the trucks would use the same routes in reverse to leave SSFL.

**Potential School Exposure**

Based on the proposed truck routes, locations of surrounding schools, and other factors, the potential number of school children exposed to the project trucks was estimated. A child's exposure to the truck traffic was considered for all modes of travel, whether traveling by car, bus, bicycle, or on foot. The assessment was based on whether the child would need to cross and/or travel along the street along the truck route to get to or from school. The safety impacts of project trucks were assessed qualitatively, and did not include a calculation of the potential number of accidents.

Factors used to estimate the exposure included the location of the school and the school attendance boundary, the recommended pedestrian routes for each school (City of Los Angeles, 2012), the school hours, and the number of students enrolled. Specifically, the following assumptions were made:

- Exposure was only considered if a child crosses the truck route and/or travels along the route.
- 100 percent of the trucks would travel on Roscoe Boulevard, 40 percent of the trucks would come from the north (SR 118), and 60 percent of the trucks would come from the south (U.S. 101).
- Average exposure time while on or crossing the truck route in a vehicle (car or bus) would be 30 seconds.
- Average exposure time while on or crossing the truck route on foot or by bike would be 60 seconds.
- Approximately 15 percent of children walk or bike to school and 85 percent are driven to school (by private automobile or bus). This assumption was based on the national average (Safe Routes Info.org, 2013).
- Children attend neighborhood schools located within their school attendance areas (with the exception of the private schools in the area). Private schools draw from a larger area, with students commuting a farther distance.
- The commute to public schools occurs on local roadways (that is, travel not assumed on SR 118 or U.S. 101).
- A portion of the trips to private schools in the ROI occurs on U.S. 101 and SR 118.
- School hours range from 7:00 a.m. to approximately 3:15 p.m. As a conservative estimate, it was assumed that all of the school start and finish times would fall within the truck delivery hours; therefore, potential exposure would occur two times a day (going to school in the morning and leaving school in the afternoon).
- There is an average of 180 school days per year.
- The demolition period would be approximately 150 days, with an additional 500 days needed for excavation and disposal activities.

Figures 4.5-1 through 4.5-3 illustrate the proposed truck routes, the projected number of truck trips per construction activity, and nearby schools that could be affected by the increase in truck traffic. Thirty-two schools (with a total enrollment of 25,527 students) were included in the evaluation based on their proximity to the truck routes. Of these schools, approximately 22 percent of students (or 5,628 students per day) would travel along and/or cross the truck route. By roadway, the totals are 702 on Roscoe Boulevard; 1,756 on Topanga Canyon Boulevard north of Roscoe Boulevard; 1,313 on Topanga Canyon Boulevard south of Roscoe Boulevard; 680 on U.S. 101, west of Topanga Canyon Boulevard; and 1,177 on U.S. 101, east of Topanga Canyon Boulevard. The school exposure analysis is presented for each construction activity in Section 4.5.1.

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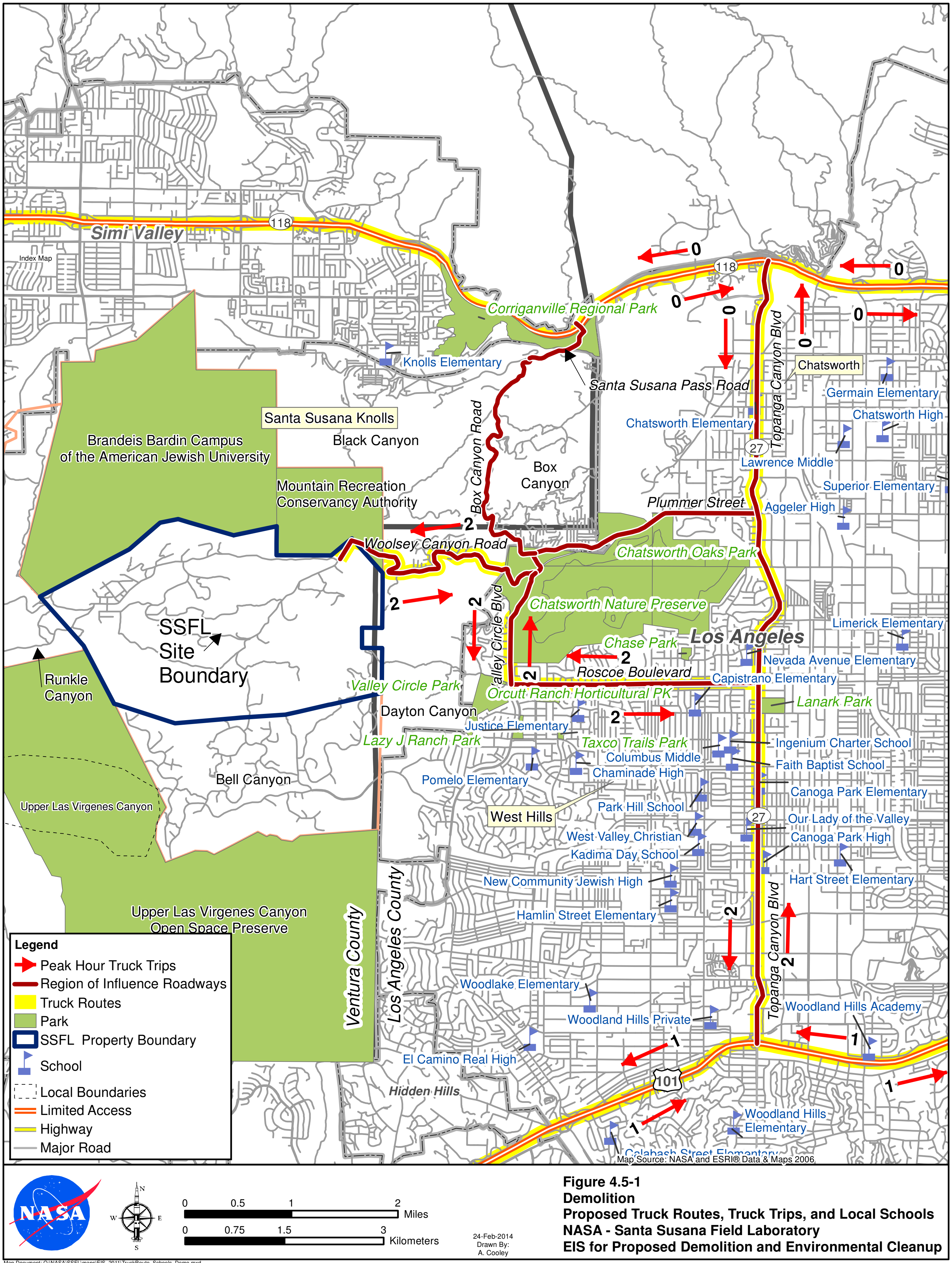


**Figure 4.5-1**
**Demolition**
**Proposed Truck Routes, Truck Trips, and Local Schools**
**NASA - Santa Susana Field Laboratory**
**EIS for Proposed Demolition and Environmental Cleanup**

Map Document: O:\NASA\SSFL\maps\EIS_2011\TruckRoute_Schools_Demo.mxd

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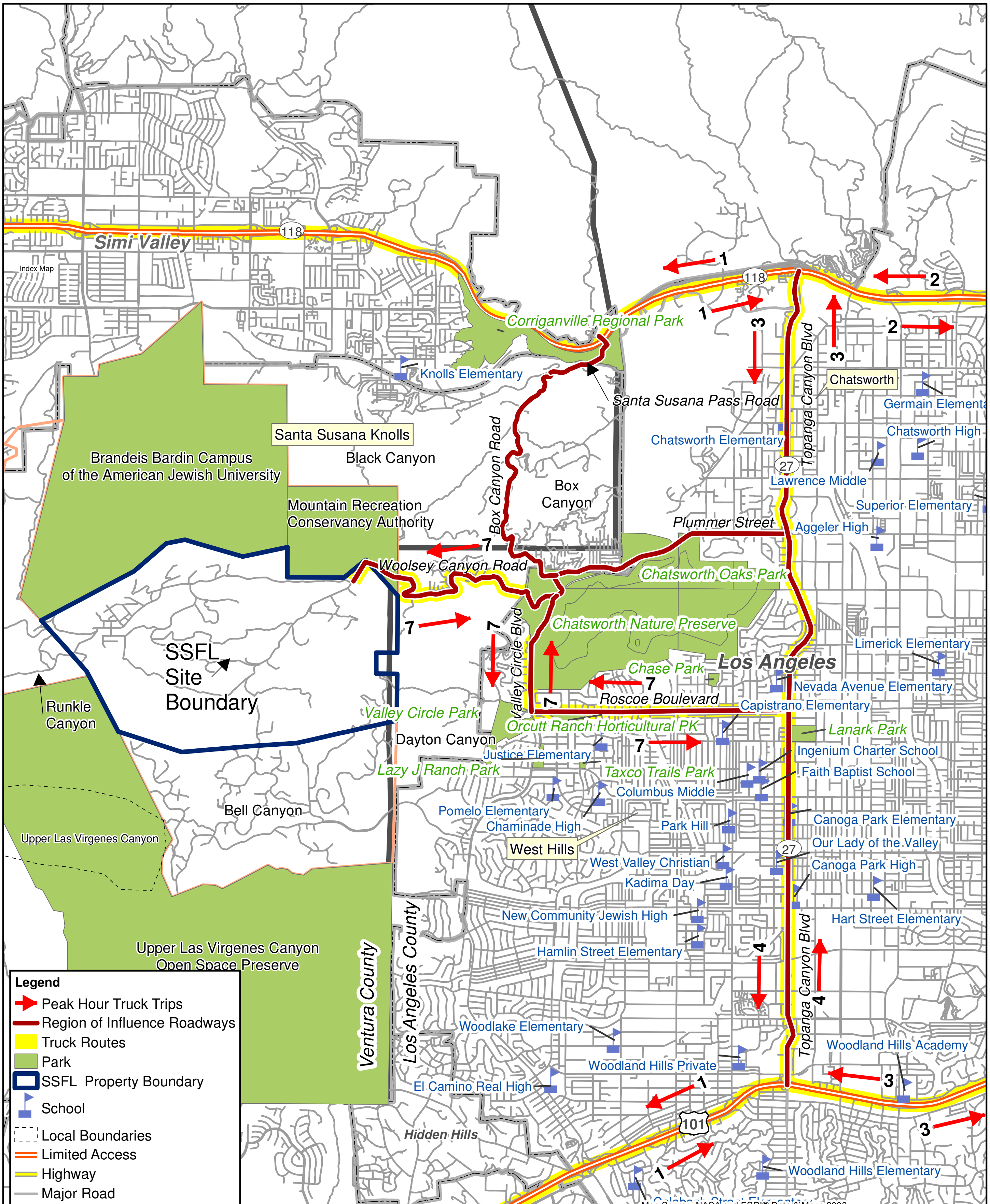


NASA

N
W E
S

0 0.5 1 2 Miles

0 0.75 1.5 3 Kilometers

24-Feb-2014
Drawn By:
A. Cooley

**Figure 4.5-2**
**100% Excavation and Disposal**
**Proposed Truck Routes, Truck Trips, and Local Schools**
**NASA - Santa Susana Field Laboratory**
**EIS for Proposed Demolition and Environmental Cleanup**

Map Document: O:\NASA\SSFL\maps\EIS_2011\TruckRoute_Schools_Excav_Disp.mxd

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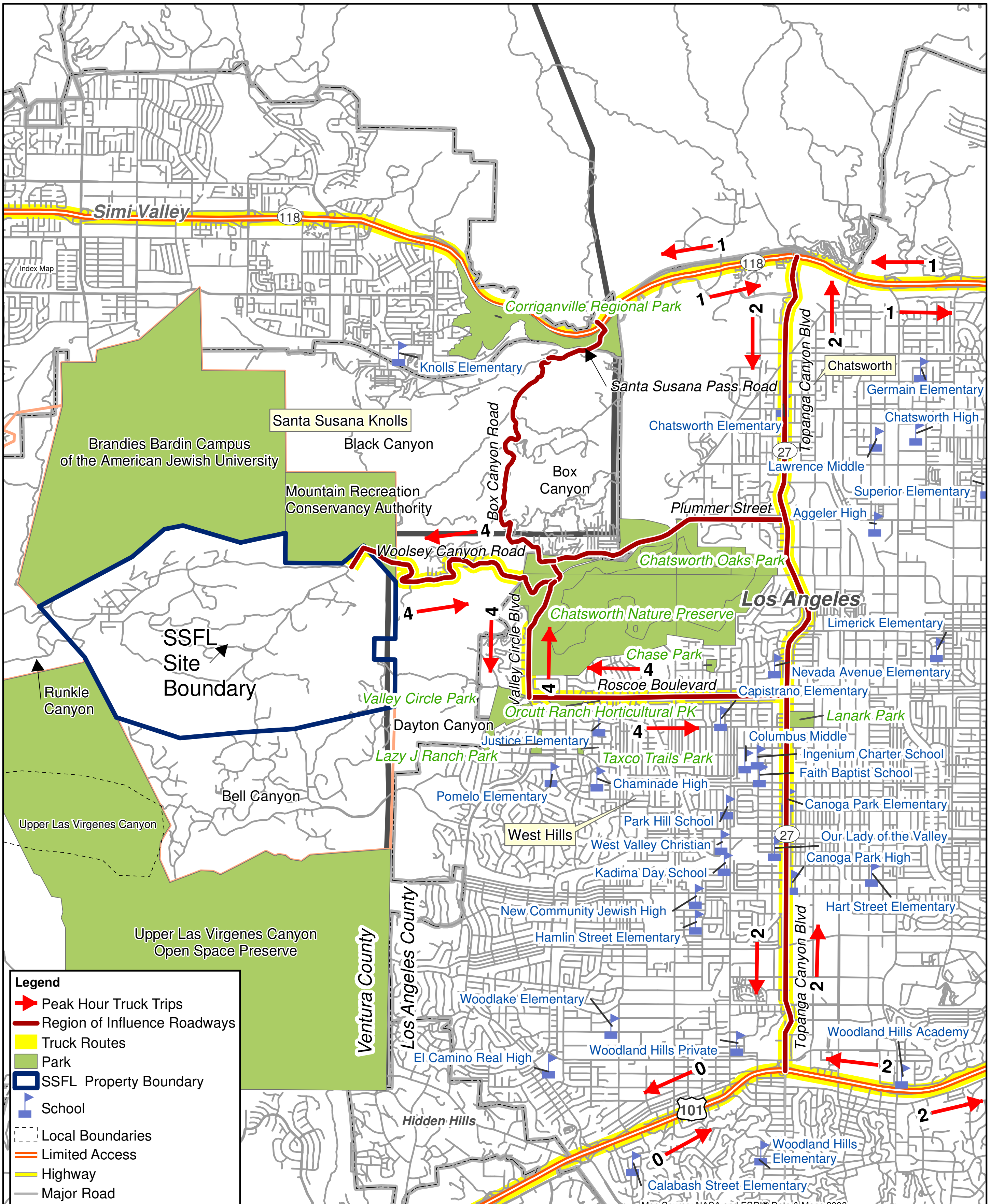


0 0.5 1 2 Miles

0 0.75 1.5 3 Kilometers

24-Feb-2014
Drawn By:
A. Cooley

**Figure 4.5-3**
**Excavation and Disposal plus Onsite Treatment**
**Proposed Truck Routes, Truck Trips, and Local Schools**
**NASA - Santa Susana Field Laboratory**
**EIS for Proposed Demolition and Environmental Cleanup**

Map Document: O:\NASA\SSFL\maps\EIS_2011\TruckRoute_Schools_Excav_Disp_Treat.mxd

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**Existing Truck Data**

In the United States in 2010, large trucks accounted for 4 percent of all registered vehicles and 10 percent of the total vehicle miles traveled. These large trucks accounted for 8 percent of all vehicles involved in fatal crashes and 3 percent of all vehicles involved in injury and property-damage-only crashes. In California, trucks were only involved in 6.5 percent of fatal crashes in 2010–less than the national average (U.S. Department of Transportation, 2012). The overall crash rate in the U.S. for all vehicles was 1.22 fatal crashes per 100 million miles traveled and 20 injury crashes per 100 million miles traveled.

Tractor trailers, dump trucks, and flatbed trucks would be used over the course of the demolition activities. These vehicles come in a variety of sizes. Federal and state regulations mandate a specific limit in dimensions on interstate and state highways. The average tractor-trailer is just over 80 ft long, 13 ft 6 inches high, and about 8 ft wide. The fully loaded weight for most tractor-trailers is 80,000 pounds, per federal mandates. The weight with an empty trailer can vary between 30,000 and 45,000 pounds. A bobtail (just the truck with no trailer) weighs between 15,000 and 20,000 pounds (Caltrans, Office of Truck Services, 2013).

The average passenger car accelerates from zero to 60 miles per hour (mph) in approximately 8 seconds and can decelerate from that speed within about 140 ft. Compared to such cars, a 550-horsepower tractor-trailer accelerates from zero to 60 mph in approximately 35 seconds when fully loaded and in 20 seconds when empty. However, that same truck can go from zero to 60 mph in just over 10 seconds without a trailer, which is comparable to many passenger cars. Stopping distance for a fully loaded truck traveling 60 mph averages 400 ft or more (Caltrans, Office of Truck Services, 2013).

Federal and state regulations also govern the operation of commercial motor vehicles. For example, no one can drive a commercial motor vehicle without a commercial driver's license (CDL) and drivers are only allowed to have one CDL. An employer cannot let anyone drive a commercial motor vehicle if he or she has more than one license or if that person's CDL is suspended or revoked. In addition, there are minimum training requirements for operators of longer-combination vehicles. Federal and state laws require a pre-trip vehicle inspection to be completed by the driver, and federal and state inspectors also inspect commercial vehicles. An unsafe vehicle can be put "out of service" until the driver or owner has it repaired (U.S. Department of Transportation, 2013). These regulations, among others, have been established to help reduce or prevent truck crashes, fatalities, and injuries.

## 4.5.1 Proposed Action–Demolition, Soil Cleanup to Background, and Groundwater Cleanup

This evaluation considered the potential effects on roadway operations and LOS during proposed construction activities, potential exposure of truck traffic to school children, potential safety effects from the project-related truck trips, and potential effects on pavement conditions and parking.

### 4.5.1.1 Project Trip Generation

The average daily traffic (ADT) and peak hour (7:00 a.m. to 9:00 a.m. and 4:00 p.m. to 6:00 p.m.) traffic were estimated for each of the proposed construction activities, including 100 percent demolition, 100 percent excavation and disposal, and excavation and disposal plus onsite treatment. Table 4.5-1 lists the daily and peak hour project trips.

TABLE 4.5-1
**Proposed Action Trip Generation Estimate**
*NASA SSFL EIS for the Proposed Demolition and Environmental Cleanup*

| Trip Type | Total Trucks/ Employees | ADT | A.M. Peak Hour Trips | | | P.M. Peak Hour Trips | | |
|---|---|---|---|---|---|---|---|---|
| | | | In | Out | Total | In | Out | Total |
| **Demolition (2014-2015)** | | | | | | | | |
| Delivery | 20 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| Haul | 3,660 | 48 | 2 | 2 | 4 | 2 | 2 | 4 |
| Passenger Car Equivalent | 9,200 | 125 | 5 | 5 | 10 | 5 | 5 | 10 |
| Workforce | 34 | 68 | 34 | 0 | 34 | 0 | 34 | 34 |
| Total Project Trips in Passenger Car Equivalents | - | 193 | 39 | 5 | 44 | 5 | 39 | 44 |
| **Excavation/Disposal (500,000 $yd^3$) (2016-2017)** | | | | | | | | |
| Delivery | 20 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| Soil Removal | 26,441 | 106 | 5 | 5 | 10 | 5 | 5 | 10 |
| Backfilling | 8,814 | 36 | 2 | 2 | 4 | 2 | 2 | 4 |
| Passenger Car Equivalent | 88,188 | 360 | 18 | 18 | 36 | 18 | 18 | 36 |
| Workforce | 15 | 30 | 15 | 0 | 15 | 0 | 15 | 15 |
| Total Project Trips in Passenger Car Equivalents | - | 390 | 33 | 18 | 51 | 18 | 33 | 51 |
| **Excavation/Disposal plus Onsite Treatment (320,000 $yd^3$) (2016-2017)** | | | | | | | | |
| Delivery | 20 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| Soil Removal | 16,842 | 68 | 3 | 3 | 6 | 3 | 3 | 6 |
| Backfilling | 5,614 | 22 | 1 | 1 | 2 | 1 | 1 | 2 |
| Passenger Car Equivalent | 56,190 | 230 | 10 | 10 | 20 | 10 | 10 | 20 |
| Workforce | 15 | 30 | 15 | 0 | 15 | 0 | 15 | 15 |
| Total Project Trips in Passenger Car Equivalents | - | 260 | 25 | 10 | 35 | 10 | 25 | 35 |

Assumptions:
Consistent with the Air Quality analysis, demolition is assumed to take 150 days and excavation (500,000 $yd^3$ or 320,000 $yd^3$) is assumed to take 500 days.
Each truck = 2.5 passenger car equivalents
Trucks arrive/depart between 7 a.m. and 7 p.m.
Deliveries would average one per day and are assumed to occur outside of peak hours.
The quantity of backfill would be dependent on the availability of clean soil; this analysis conservatively assumes clean soil is available to allow backfilling of up to one-third of the soil excavated.

## Existing and Project Traffic Conditions

The project trip estimates were added to the existing traffic volumes on each roadway segment, as detailed in Tables 4.5-2 and 4.5-3.

TABLE 4.5-2
**Peak Hour Volume to Capacity Ratios for State Highways with Project-related Trips**
*NASA SSFL EIS for the Proposed Demolition and Environmental Cleanup*

| | Existing Conditions | | Existing + Project Conditions | | | | |
|---|---|---|---|---|---|---|---|
| **Roadway Segment** | **Direction** | **Peak Hour Volume[a]** | **Peak Hour Project Trips** | **Peak Hour Volume** | **V/C Ratio** | **LOS** | **Meets LOS Threshold?** |
| **100% Demolition** | | | | | | | |
| SR 118 (at Topanga Canyon Boulevard Interchange) | EB | 5,220 | 12 | 5,232 | 0.654 | B | Yes |
| | WB | 4,840 | 11 | 4,851 | 0.606 | B | Yes |
| U.S. 101 (at Topanga Canyon Boulevard Interchange) | NB | 7,170 | 6 | 7,176 | 0.897 | D | Yes |
| | SB | 7,450 | 15 | 7,465 | 0.933 | E | No |
| **100% Excavation/Disposal (500,000 yd³)** | | | | | | | |
| SR 118 (at Topanga Canyon Boulevard Interchange) | EB | 5,220 | 12 | 5,232 | 0.654 | B | Yes |
| | WB | 4,840 | 11 | 4,851 | 0.606 | B | Yes |
| U.S. 101 (at Topanga Canyon Boulevard Interchange) | NB | 7,170 | 7 | 7,177 | 0.897 | D | Yes |
| | SB | 7,450 | 21 | 7,471 | 0.934 | E | No |
| **Excavation/Disposal (320,000 yd³) plus Onsite Treatment** | | | | | | | |
| SR 118 (at Topanga Canyon Boulevard Interchange) | EB | 5,220 | 9 | 5,229 | 0.654 | B | Yes |
| | WB | 4,840 | 8 | 4,848 | 0.606 | B | Yes |
| U.S. 101 (at Topanga Canyon Boulevard Interchange) | NB | 7,170 | 4 | 7,174 | 0.897 | D | Yes |
| | SB | 7,450 | 14 | 7,464 | 0.933 | E | No |

Assumptions:
peak hour capacity = 8,000 vehicles per hour
Notes:
EB = east bound; WB = west bound; NB = north bound; SB = south bound
V/C = volume to capacity
[a] 2011 Caltrans Freeway PeMS Traffic Data

TABLE 4.5-3
**Level of Service for Arterial Roadways**
*NASA SSFL EIS for the Proposed Demolition and Environmental Cleanup*

| **Roadway Segment** | **Existing ADT[a]** | **ADT Proposed Trips** | **Existing + Trips** | **ADT Capacity[b]** | **Existing LOS** | **Proposed LOS** | **Meets LOS Threshold?** |
|---|---|---|---|---|---|---|---|
| **100% Demolition** | | | | | | | |
| Topanga Canyon Boulevard | 47,500 | 176 | 47,676 | 50,445 | E | E | Yes |
| Roscoe Boulevard | 6,450 | 156 | 6,606 | 15,390 | B | B | Yes |
| Valley Circle Boulevard | 10,600 | 193 | 10,793 | 11,550 | D | D | Yes |
| Plummer Street | 4,200 | 20 | 4,220 | 15,675 | B | B | Yes |

TABLE 4.5-3
**Level of Service for Arterial Roadways**
*NASA SSFL EIS for the Proposed Demolition and Environmental Cleanup*

| Roadway Segment | Existing ADT[a] | ADT Proposed Trips | Existing + Trips | ADT Capacity[b] | Existing LOS | Proposed LOS | Meets LOS Threshold? |
|---|---|---|---|---|---|---|---|
| Woolsey Canyon Road | 1,500 | 193 | 1,693 | 11,550 | B | B | Yes |
| Box Canyon Road | 4,000 | 17 | 4,017 | 11,550 | B | B | Yes |
| Santa Susana Pass Road | 5,200 | 17 | 5,217 | 11,550 | B | B | Yes |
| **100% Excavation/Disposal (500,000 yd³)** | | | | | | | |
| Topanga Canyon Boulevard | 47,500 | 382 | 47,882 | 50,445 | E | E | Yes |
| Roscoe Boulevard | 6,450 | 373 | 6,823 | 15,390 | B | B | Yes |
| Valley Circle Boulevard | 10,600 | 390 | 10,990 | 11,550 | D | D | Yes |
| Plummer Street | 4,200 | 9 | 4,209 | 15,675 | B | B | Yes |
| Woolsey Canyon Road | 1,500 | 390 | 1,890 | 11,550 | B | B | Yes |
| Box Canyon Road | 4,000 | 8 | 4,008 | 11,550 | B | B | Yes |
| Santa Susana Pass Road | 5,200 | 8 | 5,208 | 11,550 | B | B | Yes |
| **Excavation/Disposal (320,000 yd³) plus Onsite Treatment** | | | | | | | |
| Topanga Canyon Boulevard | 47,500 | 252 | 47,752 | 50,445 | E | E | Yes |
| Roscoe Boulevard | 6,450 | 243 | 6,693 | 15,390 | B | B | Yes |
| Valley Circle Boulevard | 10,600 | 260 | 10,860 | 11,550 | D | D | Yes |
| Plummer Street | 4,200 | 9 | 4,209 | 15,675 | B | B | Yes |
| Woolsey Canyon Road | 1,500 | 260 | 1,760 | 11,550 | B | B | Yes |
| Box Canyon Road | 4,000 | 8 | 4,008 | 11,550 | B | B | Yes |
| Santa Susana Pass Road | 5,200 | 8 | 5,208 | 11,550 | B | B | Yes |

Notes:
[a] 2010 Caltrans Traffic Counts
[b] Florida Department of Transportation (FDOT), 2009. FDOT Level Of Service Handbook defines capacity as LOS E for most roadways

## Potential Exposure of Truck Traffic to School Children

The potential risk of truck traffic exposure to school children was estimated by roadway and by travel mode for each construction activity based on the assumptions described previously. Table 4.5-4 summarizes the exposure analysis for each activity.

TABLE 4.5-4
**Project Truck Traffic and Potential Exposure to School Children**
*NASA SSFL EIS for the Proposed Demolition and Environmental Cleanup*

| Assumptions | Roscoe Blvd. | Topanga Canyon Blvd. (North of Roscoe) | Topanga Canyon Blvd. (South of Roscoe) | U.S. 101 (West of Topanga) | U.S. 101 (East of Topanga) | Total |
|---|---|---|---|---|---|---|
| **Demolition** | | | | | | |
| Students estimated on and/or crossing truck route | 702 | 1,756 | 1,313 | 680 | 1,177 | 5,628 |
| Pedestrians/Bicyclists–15% [a] | 105 | 263 | 197 | 0 | 0 | 565 |
| In a car–85% [a] | 597 | 1,493 | 1,116 | 680 | 1,177 | 5,063 |
| Truck Trips per Hour | 4 | 0 | 4 | 2 | 2 | - |
| Minutes per Truck | 15 | 0 | 15 | 30 | 30 | - |
| Risk of Exposure–Pedestrians/Bicyclists | 7% | 0% | 7% | 3% | 3% | - |
| Risk of Exposure–In car | 3% | 0% | 3% | 2% | 2% | - |
| **Potential Exposure (Number of Students)** | | | | | | |
| Per peak hour (Pedestrians/Bicyclists) | 7 | 0 | 13 | 0 | 0 | 20 |
| Per peak hour (In car) | 20 | 0 | 37 | 11 | 20 | 88 |
| Per peak hour (Total) | 27 | 0 | 50 | 11 | 20 | 108 |
| Per day (Total) | 54 | 0 | 100 | 22 | 40 | 216 |
| Per school year (Total) | 9,720 | 0 | 18,000 | 3,960 | 7,200 | 38,880 |
| Construction period (Total) | **8,068** | **0** | **14,940** | **3,287** | **5,976** | **32,270** |
| **100% Excavation/Disposal (500,000 yd$^3$)** | | | | | | |
| Students estimated on and/or crossing truck route | 702 | 1,756 | 1,313 | 680 | 1,177 | 5,628 |
| Pedestrians/Bicyclists–15% [a] | 105 | 234 | 197 | 0 | 0 | 536 |
| In a car–85% [a] | 597 | 1,522 | 1,116 | 680 | 1,177 | 5,092 |
| Truck Trips per Hour | 14 | 6 | 8 | 2 | 6 | - |
| Minutes per Truck | 4 | 10 | 8 | 30 | 10 | - |
| Risk of Exposure–Pedestrians/Bicyclists | 23% | 10% | 13% | 3% | 10% | - |
| Risk of Exposure–In car | 12% | 5% | 7% | 2% | 5% | - |
| **Potential Exposure (Number of Students)** | | | | | | |
| Per peak hour (Pedestrians/Bicyclists) | 25 | 24 | 26 | 0 | 0 | 75 |
| Per peak hour (In car) | 69 | 76 | 74 | 11 | 59 | 289 |
| Per peak hour (Total) | 94 | 100 | 100 | 11 | 59 | 364 |
| Per day (Total) | 188 | 200 | 200 | 22 | 118 | 728 |
| Per school year (Total) | 33,840 | 36,000 | 36,000 | 3,960 | 21,240 | 131,040 |

TABLE 4.5-4
**Project Truck Traffic and Potential Exposure to School Children**
*NASA SSFL EIS for the Proposed Demolition and Environmental Cleanup*

| Assumptions | Roscoe Blvd. | Topanga Canyon Blvd. (North of Roscoe) | Topanga Canyon Blvd. (South of Roscoe) | U.S. 101 (West of Topanga) | U.S. 101 (East of Topanga) | Total |
|---|---|---|---|---|---|---|
| Construction period (Total) | **94,075** | **100,080** | **100,080** | **11,009** | **59,047** | **364,291** |
| **Excavation/Disposal plus Onsite Treatment (320,000 yd$^3$)** | | | | | | |
| Students estimated on and/or crossing truck route | 702 | 1,756 | 1,313 | 680 | 1,177 | 5,628 |
| Pedestrians/Bicyclists–15% [a] | 105 | 234 | 197 | 0 | 0 | 536 |
| In a car–85% [a] | 597 | 1,522 | 1,116 | 680 | 1,177 | 5,092 |
| Truck Trips per Hour | 8 | 4 | 4 | 1 | 4 | - |
| Minutes per Truck | 7 | 15 | 15 | 0 | 15 | - |
| Risk of Exposure–Pedestrians/Bicyclists | 13% | 7% | 7% | 0% | 7% | - |
| Risk of Exposure–In car | 7% | 3% | 3% | 0% | 3% | - |
| **Potential Exposure (Number of Students)** | | | | | | |
| Per peak hour (Pedestrians/Bicyclists) | 14 | 16 | 13 | 0 | 0 | 43 |
| Per peak hour (In car) | 40 | 51 | 37 | 0 | 39 | 167 |
| Per peak hour (Total) | 54 | 67 | 50 | 0 | 39 | 210 |
| Per day (Total) | 108 | 134 | 100 | 0 | 78 | 420 |
| Per school year (Total) | 19,440 | 24,120 | 18,000 | 0 | 14,040 | 75,600 |
| Construction period (Total) | **54,043** | **67,054** | **50,040** | **0** | **39,031** | **210,168** |

Note:
[a] The commute to area private schools is assumed to occur on U.S. 101. Therefore, 100% of the trips would be in a car.

## Potential Safety Effects from the Project-related Truck Trips

On the basis of the assessment of the increased truck traffic, exposure to school children, the acceleration and deceleration characteristics, and federal and state safety regulations, an overall impact assessment was conducted. Part of the truck route is on a steep, windy road with some blind curves, which could affect the potential for crashes. Because of the large number of child exposures, approximately 364,291 student trips (at peak truck activity), exposed to the potential of more than 100,000 truck trips, special care would be necessary to avoid having any injured child during the life of the project. However, as listed in Table 4.5-5, the project-related truck trips represent a negligible increase in traffic on the study roadways. Although the potential for a crash to occur does exist, the truck crash rate would not change with the project-added truck trips.

TABLE 4.5-5
**Percentage Increase in ADT (Truck Trips)**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Roadway | Average Daily Trips | | | | | | |
|---|---|---|---|---|---|---|---|
| | Existing | Demolition | | 100% Excavation / Disposal (500,000 yd$^3$) | | Excavation/Disposal plus Onsite Treatment (320,000 yd$^3$) | |
| | | Truck Trips | Percentage Increase in ADT | Truck Trips | Percentage Increase in ADT | Truck Trips | Percentage Increase in ADT |
| SR 118, near Topanga Canyon Boulevard | 126,000 | 20 | 0.02% | 58 | 0.05% | 36 | 0.03% |
| U.S. 101, near Topanga Canyon Boulevard | 228,000 | 30 | 0.01% | 86 | 0.04% | 56 | 0.02% |
| Topanga Canyon Boulevard | 47,500 | 50 | 0.11% | 144 | 0.30% | 92 | 0.19% |
| Roscoe Boulevard | 6,450 | 50 | 0.78% | 144 | 2.23% | 92 | 1.43% |
| Valley Circle Boulevard | 10,600 | 50 | 0.47% | 144 | 1.36% | 92 | 0.87% |
| Plummer Street | 4,200 | 0 | 0.00% | 0 | 0.00% | 0 | 0.00% |
| Woolsey Canyon Road | 1,500 | 50 | 3.33% | 144 | 9.60% | 92 | 6.13% |
| Box Canyon Road | 4,000 | 0 | 0.00% | 0 | 0.00% | 0 | 0.00% |
| Santa Susana Pass Road | 5,200 | 0 | 0.00% | 0 | 0.00% | 0 | 0.00% |

### 4.5.1.2 Demolition

**Roadway Operations and Level of Service during Proposed Activities**

The demolition activities are estimated to generate 193 ADT and 44 peak hour trips (PHTs) in both the morning and afternoon peak hour. Table 4.5-1 lists the ADT and peak hour demolition trip estimates. The demolition trips were added to the existing traffic volumes on each roadway segment, as listed in Tables 4.5-2 and 4.5-3. All roadway segments considered, except one, are forecast to operate within the acceptable LOS with the estimated traffic increases. Although southbound U.S. 101 currently exceeds the established volume to capacity (V/C) ratio threshold of 0.90, the LOS would remain the same as with existing traffic volumes, so the unacceptable operations would not result from NASA's demolition activities. The addition of the estimated demolition-related traffic to the existing traffic volumes would be measureable. However, it would not cause an acceptably operating roadway to degrade to an unacceptable LOS, or cause a roadway with an unacceptable LOS to degrade further, so the demolition activities would result in a ***minor, negative, regional,*** and ***short-term*** impact to roadway operations ***(Traffic Impact-1).***

The number of heavy vehicle and construction worker trips on individual roadways within the secondary ROI, including I-405, I-5, I-210, and SR 14, would not be measurable under the demolition activities. This impact on roadway operations, therefore, would be considered ***negligible.*** Trucks carrying materials with regional or interstate destinations might transfer loads at the Los Angeles Transportation Center intermodal rail yard to freight rail. The materials would then be hauled by freight rail to an intermodal facility nearer the materials' destination, and then be transferred back to a truck to reach the final destination, as needed.

Within the project site, only a limited number of construction vehicles would operate along roadways at any given time. Although it would not be a large volume of traffic, it would result in a measureable increase of traffic on the limited roadway facilities within the project site, thereby resulting in a ***minor, negative, regional***, and ***short-term*** impact ***(Traffic Impact-1).*** Some demolition activities might require construction of temporary access roads. The construction and operation of these roads would have ***no impact*** on roadway operations.

**Potential Exposure of Truck Traffic on School Children**

The potential risk of truck traffic exposure to school children was estimated by roadway and by travel mode for each construction activity. It is estimated that up to 32,270 student trips could be exposed to the project-related truck traffic during the anticipated 1-year demolition period, as detailed in Table 4.5-4. This potential exposure would result in a ***moderate, negative, local,*** and ***short-term*** impact ***(Traffic Impact-2).***

Restricting truck travel between 7:00 and 8:00 a.m. and 2:00 and 3:00 p.m. on weekdays would reduce exposure of school children to the project-related truck trips. Given the small number of daily trucks required for demolition (24 trucks per day), the truck trips could be scheduled during hours outside of peak school travel times without affecting the construction schedule.

**Potential Safety Effects from the Project-related Truck Trips**

As noted in Table 4.5-5, the project-related truck trips (50 ADT during demolition) would represent a negligible increase in traffic on the study roadways. Although the potential for a crash to occur would exist, the truck crash rate would not change with the project-added truck trips. This impact on roadway safety and the likelihood of a crash would be considered a ***moderate, negative, local,*** and ***short-term*** impact ***(Traffic Impact-3).*** To minimize this impact, the project would continue to implement its existing Construction Traffic Control Plan (CTCP), which includes a truck safety plan.

**Potential Effects on Pavement Conditions and Parking**

Because of the heavy vehicle trips during demolition, some degradation of Roscoe Boulevard, Valley Circle Boulevard, and Woolsey Canyon Road would be expected. Within the project site, Service Area Road also might undergo similar degradation. In some locations, this degradation could result in deteriorated pavement, which could affect comfort and pavement life. This pavement deterioration would result in a ***significant, negative, regional,*** and ***long-term*** impact to local pavement conditions of City of Los Angeles or of Los Angeles County roadways (Roscoe Boulevard, Valley Circle Boulevard, and Woolsey Canyon Road) leading to SSFL ***(Traffic Impact-4)*****.**

Sufficient parking would be provided onsite to meet the anticipated parking needs of the project. No offsite parking would be needed. As a result, the project would have ***no impact*** on parking capacity during demolition.

### 4.5.1.3 Soil Cleanup to Background

NASA is exploring multiple soil cleanup options. Excavation activities, if selected for remediation, could include two approaches and, for the purposes of this analysis, have been identified as 100 percent excavation and disposal, and excavation and disposal plus onsite treatment. If the contaminated soil were determined to be untreatable, approximately 500,000 $yd^3$ of soil would be removed (100 percent excavation and disposal). It is possible that, in certain areas, soil 2 ft bgs or more would be treatable to background levels. If this technology were to prove feasible, the soil removal volume would be reduced to approximately 320,000 $yd^3$ (excavation and disposal plus onsite treatment). The two approaches are evaluated in the following subsections.

**Roadway Operations and Level of Service during Proposed Activities**

***Excavation and Offsite Disposal***

The excavation and disposal activities were estimated to generate 390 ADT and 51 PHTs. These trips were added to the existing traffic volumes on each roadway segment, as listed in Tables 4.5-2 and 4.5-3. All roadway segments considered, except one, are forecast to operate within the acceptable LOS with the estimated traffic increases. Southbound U.S. 101 would exceed the established V/C ratio; however, the LOS would remain the same with and without the project traffic, so the unacceptable operations would not be a result of the excavation and disposal activities. The excavation-related traffic would be measureable, but would not cause an acceptably operating roadway to degrade to an unacceptable LOS, or cause a roadway with an unacceptable LOS to degrade to an LOS grade that was worse. The excavation and disposal activities would result in a ***minor, negative, regional,*** and ***short-term*** impact to roadway operations ***(Traffic Impact-1).***

The numbers of heavy vehicle and construction worker trips on individual roadways within the secondary ROI would not be measurable under the excavation and disposal activities. This impact on roadway operations, therefore, would be considered ***negligible****.*

Within the project site, a limited number of construction vehicles would operate along roadways at any given time. Although it would not be a large volume of traffic, it would result in a measureable increase of traffic on the limited roadway facilities within the project site, thereby resulting in a ***minor, negative, regional,*** and ***short-term*** impact ***(Traffic Impact-1).***

### *Excavation and Offsite Disposal with Ex Situ and In Situ Onsite Treatment*

The excavation and disposal plus onsite treatment activity would generate 260 ADT and 35 PHT. With the implementation and operation of soil and groundwater remediation technologies other than excavation and offsite disposal, the number of heavy vehicle trips would be reduced because contaminated soils and structural materials would not be transported off SSFL. The excavation and disposal plus onsite treatment activity would result in a ***minor, negative, regional,*** and ***short-term*** impact to project roadway operations ***(Traffic Impact-1).***

Similar to the excavation and disposal activity, the impact to secondary roadways would be ***negligible*** and the impact to the onsite roadways would be ***minor, negative,regional*****,** and ***short-term*** **(*Traffic Impact-1).***

## Potential Exposure of Truck Traffic to School Children

### *Excavation and Offsite Disposal*

It was estimated that up to 364,291 student trips could be exposed to the project-related truck traffic during the 2 years (500 days) of excavation and disposal activities, as listed in Table 4.5-4. This potential exposure would result in a ***moderate, negative, local,*** and ***short-term*** impact ***(Traffic Impact-2).*** This impact would be further reduced with implementation of the existing truck safety plan as NASA considers the injury of even one child as significant.

### *Excavation and Offsite Disposal with Ex Situ and In Situ Onsite Treatment*

It was estimated that up to 210,168 student trips could be exposed to the project-related truck traffic during excavation and disposal plus onsite treatment. Because fewer truck trips would be required with this option, this is roughly 154,123 fewer exposures compared to no onsite remediation. This potential exposure would result in a ***moderate, negative, local,*** and ***short-term*** impact ***(Traffic Impact-2).***

## Potential Safety Effects from the Project-related Truck Trips

### *Excavation and Offsite Disposal*

As described in Table 4.5-5, the project-related truck trips (144 ADT during excavation and disposal) would represent a negligible increase in traffic on the study roadways and the truck crash rate would not be expected to change with the project-added truck trips. This impact on roadway safety and the likelihood of a crash would be considered a ***moderate, negative, local,*** and ***short-term*** impact ***(Traffic Impact-3).*** To minimize this impact, the project would continue to implement the existing truck safety plan.

### *Excavation and Offsite Disposal with Ex Situ and In Situ Onsite Treatment*

The excavation and disposal plus onsite treatment option would result in a similar impact to safety as described previously. The project-related truck trips (92 ADT during excavation and disposal plus onsite treatment) would represent a negligible increase in traffic on the study roadways and would result in a

***moderate, negative, local,*** and ***short-term*** impact ***(Traffic Impact-3)*** on roadway safety. To minimize this impact, the project would continue to implement the existing truck safety plan.

**Potential Effects on Pavement Conditions and Parking**

***Excavation and Offsite Disposal***

Some degradation of Roscoe Boulevard, Valley Circle Boulevard, and Woolsey Canyon Road would be expected as a result of the heavy vehicle trips occurring during excavation and disposal. Within the project site, Service Area Road also might undergo similar degradation. This pavement deterioration would result in a ***significant, negative, regional,*** and ***long-term*** impact to local pavement conditions of City of Los Angeles or Los Angeles County roadways (Roscoe Boulevard, Valley Circle Boulevard, and Woolsey Canyon Road) leading to SSFL ***(Traffic Impact-4).***

Sufficient parking would be provided onsite to meet the anticipated parking needs of the project. No offsite parking would be needed. As a result, the project would have ***no impact*** on parking capacity during excavation and disposal.

***Excavation and Offsite Disposal with Ex Situ and In Situ Onsite Treatment***

Impacts to pavement conditions and parking would be similar to those described previously for excavation and disposal activities. The deterioration to pavement conditions would result in a ***significant, negative, regional,*** and ***long-term*** impact ***(Traffic Impact-4).*** There would be ***no impact*** on parking capacity.

#### 4.5.1.4 Groundwater Cleanup

Because fewer truck trips would be required for the various groundwater cleanup technologies, implementation of these technologies would result in fewer but similar impacts than those identified for the demolition, excavation and disposal, and excavation and disposal plus onsite treatment activities. Traffic would be limited to trucks and equipment accessing SSFL and remaining onsite until work was complete, because offsite hauling would not be necessary.

There would be no discernible difference in the potential traffic impacts between the pump-and-treat, vacuum extraction, heat-driven extraction, in situ chemical oxidation, in situ enhanced bio remediation, and MNA technologies. Therefore, these technologies have been analyzed together.

**Roadway Operations and Level of Service during Proposed Activities**

The traffic generated from the groundwater treatment technologies would not cause an acceptably operating roadway to degrade to an unacceptable LOS, or cause a roadway with an unacceptable LOS to degrade further. The groundwater cleanup technologies would result in a ***minor, negative, regional,*** and ***short-term*** impact to roadway operations ***(Traffic Impact-1).***

**Potential Exposure of Truck Traffic to School Children**

The potential truck traffic exposure to school children would be similar to the impacts described for demolition, 100 percent excavation and disposal, and the excavation and disposal plus onsite treatment activities. The potential exposure would result in a ***moderate, negative, local,*** and ***short-term*** impact ***(Traffic Impact-2).***

**Potential Safety Effects from the Project-related Truck Trips**

The potential truck safety effects would be similar to the impacts described for demolition, 100 percent excavation and disposal, and excavation and disposal plus onsite treatment. There would be a ***moderate negative, local,*** and ***short-term*** impact ***(Traffic Impact-3)*** from the project-added truck trips.

**Potential Effects on Pavement Conditions and Parking**

The potential impacts to pavement conditions and parking would be similar to the impacts described for demolition, 100 percent excavation and disposal, and excavation and disposal plus onsite treatment. The deterioration to pavement conditions would result in a ***significant, negative, regional,*** and ***long-term*** impact ***(Traffic Impact-4).*** There would be ***no impact*** on parking capacity.

### 4.5.2 Mitigation Measures

This subsection provides a brief description of impacts previously discussed in detail, along with corresponding mitigation measures. Mitigation is an action that would benefit the environment, but must be agreed to by agency stakeholders and NASA. Agreed-upon mitigation measures would be provided in the ROD. These impacts and mitigation measures are numbered to correspond to the impact summary table provided in Section 4.5.4.

***Traffic Mitigation Measure-1:*** As a mitigation measure for efficient and safe traffic management, a NASA Construction Transportation and Control Plan (N-CTCP)—similar to Boeing's existing CTCP, which includes a traffic control plan, parking plan, existing and construction traffic operations, motorist information strategies, truck safety plan, hazardous materials transport plan, and ridesharing plan—will be developed. The N-CTCP would include the proposed activities and be implemented through the completion of cleanup activities, which is planned for 2017. NASA will coordinate traffic control plans with Boeing and DOE. Impacts to roadway operations (Traffic Impact-1) would remain ***minor, negative, regional,*** and ***short term***. Impacts to truck exposure to school children (Traffic Impact-2) and truck safety impacts (Traffic Impact-3) would be reduced to ***minor, negative, local,*** and ***short term.***

***Traffic Mitigation Measure-2*:** In anticipation of the roadway damage identified ***(Traffic Impact-4),*** NASA would survey Woolsey Canyon Road conditions prior to the commencement of work and would repair damage caused by its demolition and cleanup activities. NASA would seek to enter into an agreement with Boeing and DOE to share this work. Therefore, implementation of this mitigation would reduce the impact to a ***minor, negative, regional,*** and ***short-term*** impact for relevant roads.

### 4.5.3 No Action Alternative

The No Action Alternative would not increase traffic volumes beyond the existing or background levels, as summarized in Tables 3.10-3 and 3.10-4. These existing volumes include ongoing activities at SSFL, some of which include offsite construction and haul trucks. These existing volumes are included in Tables 3.10-3 and 3.10-4. The existing traffic volumes are within the acceptable LOS, with the exception of U.S. 101. The No Action Alternative would result in ***no impact*** to roadway operations.

The No Action Alternative would not change the truck traffic exposure to school children or safety effects from truck traffic beyond those of the current conditions, resulting in ***no impact.***

The No Action Alternative would result in ***no impact*** to parking. Pavement conditions would continue to degrade at the existing rate, resulting in a measureable, ***minor, negative, regional*,** and ***long-term*** impact on pavement condition ***(Traffic Impact-4).***

### 4.5.4 Summary of Impacts and Mitigation Measures

Table 4.5-6 provides a summary of the impacts on traffic and transportation, as described in this section. Impact and mitigation numbering correspond to Table 4.5-6. The specific mitigation and corresponding impact are provided, followed by a resulting impact level if mitigation is applied successfully. Table 4.5-6 concludes with an overall alternative impact level, based on the highest level of impact identified in the analysis.

TABLE 4.5-6
**Summary of Impacts and Mitigation Measures on Traffic and Transportation**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Impacts[a] | Project Alternatives[a] | | Mitigation Measures[a] | Impact After Mitigation Measures[a] |
|---|---|---|---|---|
| | Proposed Action | No Action | | |
| Traffic-1: Roadway operations | Minor, negative, regional, short term ⭘ | No impact ▽ | Traffic MM-1 | Minor, negative, regional, short term ⭘ |
| Traffic-2: Truck traffic exposure on school children | Moderate, negative, local, short term ⦿ | No impact ▽ | Traffic MM-1 | Minor, negative, local, short term ⭘ |
| Traffic-3: Safety effects from truck traffic | Moderate, negative, local, short term ⦿ | No impact ▽ | Traffic MM-1 | Minor, negative, local, short term ⭘ |
| Traffic-4: Pavement Conditions (Roscoe Boulevard, Valley Circle Boulevard; and Woolsey Canyon Road) | Significant, negative, regional, long term ● | Minor, negative, regional, long term ⭘ | Traffic MM-2 | Minor, negative, regional, short term ⭘ |
| **Overall Alternative Impact** | Significant, negative, regional, long term ● | Minor, negative, regional, long term ⭘ | Traffic MM-1<br>Traffic MM-2 | Minor, negative, regional, short term ⭘ |

Notes:
● or ■ = Significant
⦿ or ▣ = Moderate
⭘ or ◘ = Minor
○ or □ = Negligible
▽ = No impact
Circular symbols represent negative impacts while square symbols represent beneficial impacts, and the degree to which the symbol is filled represents the severity of the impact.

MM = mitigation measure

[a] Potential impacts and mitigation measures are discussed further in Sections 4.5.1 through 4.5.3.

# 4.6 Water Resources

This subsection describes the potential impacts to water resources by the implementation of the Proposed Action or the No Action Alternative. The ROI is defined as SSFL and connected watersheds for surface water and the area included in the mountain groundwater system that encompasses SSFL for groundwater.

Section 4.6.1 includes a summary of the impact analysis to the site water resources under the various soil and groundwater cleanup scenarios. Section 4.6.2 provides information about potential impacts and BMPs applicable to water resources. Section 4.6.3 provides a discussion of the No Action Alternative. Section 4.6.4 includes a summary table of impacts and corresponding BMPs identified in the site water resources analysis. Impacts and BMPs are numbered to correspond with the summary table to indicate where impacts might occur and how BMPs might offset those impacts.

Potential impacts to water resources that might result from the proposed demolition and remedial activities generally would include removal of impervious surfaces and increased erosion as a result of demolition, increased erosion and sediment transportation as a result of excavation, accidental release of hazardous substances to surface water or groundwater, impairment of Section 303(d)-listed water bodies, changes to surface water and/or groundwater hydrology, or effects on water quality as a result of the proposed remedial technologies.

The analysis of impacts on water resources was based on a review of various NASA surveys and studies characterizing the existing surface water and groundwater contamination at SSFL (NASA, 2008b, 2009a, 2009b; MWH, 2005, 2007a, 2007b).

The evaluation criteria for water resources include changes in surface water and groundwater hydrology (drainage, stormwater runoff, local flooding, or percolation) or impacts to surface water or groundwater quality. The following descriptions identify the thresholds of impacts relevant to the water resource analysis:

| Impact | Description |
|---|---|
| No Impact | No impacts to surface water or groundwater resources would be expected. |
| Negligible | Impacts would not noticeably alter surface water or groundwater resources from historical hydrologic and water quality conditions. |
| Minor | Impacts to surface water or groundwater resources would be within historical hydrologic or desired water quality conditions. |
| Moderate | Impacts to surface water or groundwater resources would appreciably alter resource conditions. Historical baseline or desired water quality conditions would be altered temporally. |
| Significant | Impacts would alter the long-term surface water or groundwater resources from the historical hydrologic baseline or desired water quality conditions. |
| Quality: | Beneficial–would have a positive effect on the water resources or physical environment.<br>Negative–would have an adverse effect on the water resources or physical environment. |
| Proximity: | Local–would occur within the NASA-administered property at SSFL.<br>Regional–would occur outside the NASA-administered property at SSFL. |
| Duration: | Short term–would occur only during the proposed demolition and immediate remediation period.<br>Long term–would continue beyond the proposed demolition and immediate remediation period. |

## 4.6.1 Proposed Actions–Demolition, Soil Cleanup to Background Levels, and Groundwater Cleanup

### 4.6.1.1 Demolition

This subsection describes the potential impacts to surface water and groundwater hydrology, surface water quality, and groundwater quality that could occur as a result of demolition activities.

**Surface Water and Groundwater Hydrology**

Demolition would include the removal of structures up to 5 ft below grade; this removal would reduce the amount of impervious surface throughout the NASA-administered property at SSFL, resulting in a site that would be more similar to natural topographic and hydrologic conditions. Specifically, demolishing structures would allow for increased infiltration to groundwater, with a corresponding reduction in surface runoff. Within the NASA-administered portion of the Northern Drainage area (approximately 136 acres), about 120,000 square feet of structures would be demolished, which is 2 percent of the Northern Drainage area. The NASA-administered portion of the Southwestern Drainage is approximately 308 acres; within this drainage area, about 100,500 square feet of structures would be demolished, which equates to less than 1 percent of the Southwestern Drainage area. Because the area of impervious surfaces would be reduced, the amount of runoff potential would be reduced and infiltration potential would be increased. As a result, the impact on hydrology and drainage that could result from implementation of the proposed demolition activities would be ***minor, beneficial, local,*** and ***long term*** *(**Water Impact-1a**).* The stockpiling and staging areas would be sited to avoid or minimize impacts to surface water and groundwater resources, including hydrology and drainage.

**Surface Water and Groundwater Quality**

SSFL is characterized by extremely steep slopes. Therefore, demolition might result in increased erosion due to soil disturbance, accidental release of hazardous materials from construction equipment (fuel and lubricants), and releases of hazardous materials from the demolished structures (lead-based paint and asbestos). In the short term, the potential would exist for contaminant concentrations to increase in surface drainage as a result of demolition activities. As described in Sections 2.2 and 4.12, NASA would characterize hazardous materials present in the structures and take appropriate actions to control these materials and dispose of them properly. Demolition would not contribute to increased levels of impairment in 303(d)-listed water bodies in either the Los Angeles River or in the Calleguas Creek watersheds, and would not interfere with total maximum daily load (TMDL) implementation.

Applications of clean water for dust control (***Air Quality BMP-1*** and ***Mitigation Measure-3***) would not affect groundwater; likewise, surface water quality would not be affected because the quantity of water applied for dust control would not be great enough to cause changes in surface flow or flooding.

Because existing groundwater contamination is relatively deep within the Chatsworth Formation Operable Unit (CFOU), surface and near-surface disturbances from demolition activities would be unlikely to change the existing groundwater quality within the deep aquifer.

Demolition activities potentially would encounter the shallow aquifer (Surficial Media Operable Unit [SMOU]), occurring at depths as shallow as 4 ft bgs, which could carry new and potentially contaminated soils to the surface. These contaminants could enter the stormwater flow paths and affect water quality onsite and offsite. For these reasons, demolition activities would have a ***moderate, negative, local,*** and ***long-term*** impact to surface water and groundwater quality *(**Water Impact-1b**).*

### 4.6.1.2 Soil Cleanup to Background

This subsection discusses the potential effects of implementing the soil and groundwater cleanup technologies on surface water and groundwater hydrology, surface water quality, and groundwater quality. The effects that might result from the implementation of each remedial technology are compared.

### Excavation and Offsite Disposal

#### *Surface Water and Groundwater Hydrology*

Under the soil remediation approach using excavation and offsite disposal, a minimum 320,000 $yd^3$ of excavated soil from within the NASA-administered portion of SSFL would be transported offsite. Excavation would affect approximately 18 percent of the land in Area II and 16 percent of the land in the NASA-administered portion of Area I, approximately 105 acres of disturbed area. Additional borrow sites within and outside of SSFL would be excavated to provide fill material (up to one third) for the remediation areas. Even with the replacement of up to one third of the excavated soils with fill, excavation of soil to bedrock would alter site drainage conditions. This impact would occur at SSFL borrow sites, as well. The likely outcome of this significant excavation would be to create new ponded areas. Although surface flows would be decreased, the additional infiltration would increase discharges from existing seeps, thus increasing surface flows downstream of the seeps. A portion of the increased infiltration, however, would be lost to deep percolation, resulting in an overall net decrease in surface flows. The small overall net decrease in surface flows would be considered a ***minor, negative, local,*** and ***long-term*** impact ***(Water Impact-2a).*** The impact would be similar if an additional 180,000 $yd^3$ had to be excavated to remove the contaminated soil–no additional surface area would be disturbed, but the depth of the excavation and the duration of the impact would increase.

#### *Surface Water Quality*

Soil excavation could result in erosion from soil disturbance (and subsequent releases of sediment into surface waters) and the potential release of hazardous materials from construction equipment. Stormwater runoff has the potential to increase soil transport away from the excavation site into surface waters. Local and offsite drainages could be affected negatively by these sedimentation and contamination impacts. Generally, as an area of disturbed soil increases, the potential for sediment transport and surface water contamination increases. Additionally, staging and stockpiling of soil would have some impact through runoff during the wet season. The potential for surface water sedimentation and contamination impacts under the excavation would be ***moderate, negative, local,*** and ***long term (Water Impact-4a).*** Excavation at the minimum volume (approximately 320,000 $yd^3$) would expose approximately the same amount of soil as the 500,000-$yd^3$ excavation, because the footprint of the excavation would be similar. A reduction in the footprint of the excavated areas would reduce potential surface water runoff, and measures that limit the amount of exposed soil at any given time would help reduce these impacts.

#### *Groundwater Quality*

Soil excavation and offsite disposal would result in the potential release of hazardous materials from construction equipment. The potential for contamination impacts for both the 500,000- and 320,000-$yd^3$ excavations would be ***minor, negative, local,*** and ***long term (Water Impact 6a).*** Sections 4.12 and 4.9 contain additional discussions.

In the long term, groundwater and soil cleanup levels, regardless of the remediation approach, likely would reduce groundwater contaminant concentrations, both within the CFOU itself and within the soil (because lower soil concentrations would be susceptible to leaching). Contaminant flux from the plume could decrease gradually through the action of natural processes (adsorption, geochemical degradation, and dispersion) to background concentrations, as fresh groundwater was introduced to the plume area from recharge areas and as the contaminant mass in the groundwater was depleted. However, because no specific cleanup target has been prescribed and some contamination presumably would remain, impacts would be considered ***moderate, beneficial, regional,*** and ***long term (Water Impact-6b).***

### Excavation and Offsite Disposal with Ex Situ Onsite Treatment

#### *Surface Water and Groundwater Hydrology*

Soil remediation approaches that would excavate further and then backfill using original soil (ex situ treatment using land farming or using thermal desorption) would have similar hydrologic effects as excavation and offsite disposal. However, the excavation would be backfilled after the Look-Up Table values had been met, thus leaving fewer new ponding areas in the long term in areas where soils were excavated. Although backfilled excavations would have different hydrologic properties than with conditions prior to excavation, overall rates of runoff and infiltration likely would be similar. However, both ex situ treatments using either land farming or thermal desorption would create new impervious surfaces at SSFL, which could lead to increased runoff and decreased infiltration. Especially pertinent to ex situ treatments using land farming due to permanent changes in impervious surfaces that could result in a ***moderate, negative, local,*** and ***long-term*** incremental impact because of the extent of excavated material. These technologies would be applicable only to those areas contaminated by organic compounds *(**Water Impact-2b**).*

***Surface Water Quality***

The soil remediation approaches would result in erosion from soil disturbance (and subsequent release of sediment into surface waters) and the potential release of hazardous materials from construction equipment. The potential for surface water sedimentation and contamination impacts would be ***minor, negative, local,*** and ***long term*** *(**Water Impact-4c**).* Sections 4.12 and 4.9 provide additional discussion.

***Groundwater Quality***

All soil remediation approaches would result in the potential release of hazardous materials from construction equipment. The potential for contamination impacts would be ***minor, negative, local,*** and ***long term*** *(**Water Impact-6a**)*. Sections 4.12 and 4.9 provide additional discussion.

In the long term, groundwater and soil cleanup levels, regardless of the remediation approach, likely would reduce groundwater contaminant concentrations, both within the CFOU itself and within the soil (because lower soil concentrations would be susceptible to leaching). Contaminant flux from the plume could decrease gradually through the action of natural processes (adsorption, geochemical degradation, and dispersion) to background concentrations, as fresh groundwater was introduced to the plume area from recharge areas and as the contaminant mass in the groundwater was depleted. However, because no specific cleanup target has been prescribed and some contamination presumably would remain, impacts would be considered ***moderate, beneficial, regional,*** and ***long term (Water Impact-6b).***

**Excavation and Offsite Disposal with In Situ Onsite Treatments**

***Surface Water and Groundwater Hydrology***

The incremental impact after excavation of the initial non-treatable soil (105 acres) would be ***negligible, negative, local,*** and ***short-term*** drainage impacts associated with onsite or in situ soil treatment approaches (SVE, chemical oxidation, or anaerobic or aerobic biological treatment) *(**Water Impact-2c**).*

***Surface Water Quality***

All groundwater and soil remediation approaches would result in erosion from soil disturbance (and subsequent release of sediment into surface waters) and the potential release of hazardous materials from construction equipment. The extent of this impact would range from small disturbance areas (groundwater injection wells) to much larger disturbance areas (soil extraction sites).

Some soil remediation approaches would introduce new sources of potential surface water contamination. For example, in situ remediation would inject chemicals such as hydrogen peroxide, permanganate, ozone, lactate, corn syrup, or vegetable oil. Good site management practices would prevent direct contamination of surface waters; however, infiltration of contaminants could result in surface water contamination at seeps. Effects on surface water quality would be minor given the existing regulatory controls and assuming strict adherence during remediation implementation. The potential for surface water impacts would be ***minor, negative, local,*** and ***short term,*** because the soil remediation chemicals would be designed to react with contaminants or to be digested by microorganisms *(**Water Impact-4b**).*

***Groundwater Quality***

The groundwater and soil remediation approaches would result in the potential release of hazardous materials from construction equipment. The potential for contamination impacts would be ***minor, negative, local,*** and ***long term (Water Impact-6a).*** Sections 4.12 and 4.9 contain additional discussion.

Remediation approaches that involved the addition of chemicals such as oxidants, nitrogen, and phosphorus would have no impact on groundwater quality because added chemicals would be consumed during the remediation process or become assimilated into the rock matrix; therefore, there would be ***no impact.***

In the long term, groundwater and soil cleanup to Look-Up Table values, regardless of the remediation approach, likely would reduce groundwater contaminant concentrations, both within the CFOU itself and within the soil (because lower soil concentrations would be susceptible to leaching). Contaminant flux from the plume could decrease gradually through the action of natural processes (adsorption, geochemical degradation, and dispersion) to background concentrations, as fresh groundwater was introduced to the plume area from recharge areas and as the contaminant mass in the groundwater was depleted. Groundwater cleanup activities would alter existing water quality conditions appreciably. However, because no specific cleanup target has been prescribed and some contamination presumably would remain, impacts would be considered ***moderate, beneficial, regional,*** and ***long term (Water Impact-6b).***

### 4.6.1.3 Groundwater Cleanup

***Surface Water and Groundwater Hydrology***

Extraction wells associated with groundwater remediation technologies requiring pumping (pump-and-treat, vacuum extraction, and heat-driven extraction) would consist of small, scattered structures. Injection wells and associated facilities (slurry tanks) associated with injection-based groundwater remediation technologies (in situ chemical oxidation and in situ enhanced bioremediation) also would include small, scattered structures. With the possible exception of groundwater extraction wells, no other structures or equipment would be placed or constructed within drainage channels, thereby minimizing the potential for localized flooding or other interference with drainage functions. The impact on hydrologic functions, therefore, would be ***minor, negative, local,*** and ***long term (Water Impact-3a).***

Discharge of extracted groundwater (following treatment) into surface water features would increase surface flows under pump-and-treat and (to a lesser extent) heat-driven extraction approaches. Adding water to surface ephemeral drainages might have negative effects on surface water hydrology by worsening winter peak flows and by introducing water in summer to normally dry channels. These hydrologic changes likely would be a ***moderate, negative, local,*** and ***long term*** impact ***(Water Impact-3b).***

Surface water originating as groundwater discharge at seeps could be affected by groundwater remediation approaches that involve groundwater pumping, which could affect downstream flows in the Northern and Southwestern drainages, depending on the location of the groundwater capture zone. Some seeps could cease flowing due to groundwater pumping activities resulting in a negative impact to the adjacent ecosystems unless the seeps were contaminated which could then result in a beneficial impact since contamination would no longer be released to the surface. However, because the seeps are intermittent and many are dry as a result of ongoing pump-and-treat activities (GETS), changes likely would to be within the range of normal seep discharges, and normal discharge patterns would resume after groundwater pumping ended. For these reasons, hydrologic changes likely would result in a ***negligible, negative, local,*** and ***long-term*** impact ***(Water Impact-3c).***

The MNA approach would have ***no impact*** on runoff and infiltration.

Sites designated for staging, stockpiling, or access would result in minimal grading and site preparation work. These activities would not come into contact with surface waters. In addition, the stockpiling and staging areas would be located to avoid or minimize impacts to surface water resources.

***Surface Water Quality***

The groundwater remediation approaches could result in erosion from soil disturbance (and subsequent releases of sediment into surface waters) and potential releases of hazardous materials from construction equipment. The extent of this impact would be small because of the small footprint of the groundwater remediation technologies. The potential for surface water sedimentation and contamination impacts would be ***moderate, negative, local,*** and ***long term (Water Impact-5a).***

Chemicals injected as part of the various groundwater remediation approaches, including oxidants, nitrogen, and phosphorus, would be consumed during the remediation process or become assimilated into the rock matrix; therefore, there would be ***no impact.***

There would be ***no impact*** to surface water associated with groundwater remediation approaches that involve groundwater pumping with no chemical addition, including pump-and-treat and vacuum extraction technologies.

Heat-driven extraction would not introduce chemicals to groundwater, but groundwater would be heated to at or near the boiling point. Watercourses in the Calleguas Creek and Los Angeles River watersheds are not listed as impaired due to high temperatures, and temperatures would be ambient by the time water reached these watersheds. Therefore, the potential impacts from implementation of the heat-driven extraction technology would be ***minor, negative, local,*** and ***short term (Water Impact-5b).***

The MNA approach would have ***no impact*** on surface water quality.

***Groundwater Quality***

The groundwater remediation approaches would result in the potential release of hazardous materials from construction equipment. The extents of this impact would range from small disturbance areas (groundwater injection wells) to much larger disturbance areas (soil extraction sites). The potential for contamination impacts would be ***minor, negative, local,*** and ***long term (Water Impact-6a).***

Remediation approaches that involved the addition of chemicals such as oxidants, nitrogen, and phosphorus would have ***no impact*** on groundwater quality because added chemicals would be consumed during the remediation process or become assimilated into the rock matrix.

In the long term, groundwater cleanup to levels attained by following the procedures in the Standardized Risk Assessment Methodology (SRAM), regardless of the remediation approach, likely would reduce groundwater contaminant concentrations, both within the CFOU itself and within the soil (because lower soil concentrations would be susceptible to leaching). Contaminant flux from the plume could decrease gradually through the action of natural processes (adsorption, geochemical degradation, and dispersion) to background concentrations, as fresh groundwater was introduced to the plume area from recharge areas and as the contaminant mass in the groundwater was depleted. Groundwater cleanup activities likely would alter existing water quality conditions appreciably; however, because no specific cleanup target has been prescribed and some contamination presumably would remain, impacts would be considered ***moderate, beneficial, regional,*** and ***long term (Water Impact-6b).***

## 4.6.2 Best Management Practices

This subsection provides a brief description of impacts previously discussed in detail, along with corresponding BMPs. BMPs are defined as actions required by law or an industry standard included in the Proposed Action activities. These impacts and BMPs are numbered to correspond to the impact summary table provided in Section 4.6.4.

***Water BMP-1*****:** Site activities would take place in accordance with the statewide General Permit for Stormwater Discharges Associated with Construction Activity (Order No. 2009-0009-DWQ [NPDES No. CAS000002]). As required by this permit, NASA would prepare an SWPPP and an ECP that specified site management activities to protect stormwater runoff and to minimize erosion during construction, operation, and maintenance of the project. NASA also would continue monitoring offsite drainages for increased sediment load and contamination. The SWPPP would include the protocol for proper storage and use of hazardous materials, as well as spill response procedures.

These management activities would include construction stormwater BMPs (silt fences, sand bags, straw waddles, and tire washes), dewatering runoff controls, containment for chemical storage areas, and construction equipment decontamination. The combined effect of demolition and remediation activities on the potential to increase surface water and groundwater pollution would be minor, given the regulatory controls in place to protect water quality and that NASA would adhere to these requirements. Therefore, with mitigation, there would be ***negligible, negative, local,*** and ***short term*** impacts after demolition *(**Water Impacts-1a and 1b**),* and ***negligible, negative, local,*** and ***long term*** impacts after remediation **(*Water Impacts-2a*** through ***2c, 3a*** through ***3c, 4a*** through ***4c, 5a*** and ***5b,*** and ***6a***). ***Water Impact – 6b*** would be ***minor to moderate, beneficial, local,*** and **long *term*** with mitigation.

## 4.6.3 No Action Alternative

Under the No Action Alternative, NASA would not perform environmental cleanup beyond the ongoing GETS and ISRA activities being conducted under separate regulatory direction. Ongoing groundwater and surface water sampling and restoration activities being conducted at the site would continue. Once those ongoing remedial programs were concluded, no further remedial action or monitoring would occur. Remnant contaminant concentrations in soil and groundwater after the GETS and ISRA programs were concluded would be commensurately greater. Natural attenuation could take hundreds of years and, therefore, could lengthen the risk of harmful exposure. No monitoring would occur as part of the natural attenuation to verify this improvement. This impact on surface and groundwater quality would be considered ***moderate, negative, potentially regional*****,** and ***long term*** *(**Water Impacts-1a*** and ***1b, 2a*** through ***2c, 3a*** through ***3c, 4a*** through ***4c, 5a*** and ***5b,*** and ***6a*** and ***6b***).

## 4.6.4 Summary of Impacts and Best Management Practices

Table 4.6-1 provides a summary of the impacts on water resources, as described in this subsection. Impact and BMP numbering corresponds to Table 4.6-1. The specific BMP and corresponding impact are provided, followed by a resulting impact level if the BMP was applied successfully. Table 4.6-1 concludes with an overall alternative impact level, based on the highest level of impact identified in the analysis.

TABLE 4.6-1
**Summary of Water Resources Impacts and Best Management Practices**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Impacts[a] | Project Alternatives[a] | | Best Management Practices [a] | Impact After Best Management Practices[a] |
|---|---|---|---|---|
| | **Proposed Action** | **No Action** | | |
| Water-1a: Demolition effects on surface and groundwater hydrology and drainage | Minor, beneficial, local, long term ◘ | Moderate, negative, potentially regional, long term ◉ | Water BMP-1 | Negligible, negative, local, short term ○ |
| Water-1b: Demolition effects on surface water and groundwater quality | Moderate, negative, local, long term ◉ | Moderate, negative, potentially regional, long term ◉ | Water BMP-1 | Negligible, negative, local, short term ○ |
| Water 2a: Soil remedial technologies effects on surface and groundwater hydrology (excavation and offsite disposal) | Minor, negative, local, long term ⭘ | Moderate, negative, potentially regional, long term ◉ | Water BMP-1 | Negligible, negative, local, long term ○ |
| Water 2b: Soil remedial technologies effects on surface and groundwater hydrology (ex situ treatment using land farming or using thermal desorption) | Moderate, negative, local, long term ◉ | Moderate, negative, potentially regional, long term ◉ | Water BMP-1 | Negligible, negative, local, long term ○ |
| Water 2c: Soil remedial technologies effects on surface and groundwater hydrology (SVE; or in situ physical treatment using soil mixing, chemical oxidation, or anaerobic or aerobic biological treatment) | Negligible, negative, local, short term ○ | Moderate, negative, potentially regional, long term ◉ | Water BMP-1 | Negligible, negative, local, long term ○ |
| Water-3a: Groundwater remedial technologies effects on surface and groundwater hydrology (pump-and-treat, vacuum extraction, and heat-driven extraction, in situ chemical oxidation, and in situ enhanced bioremediation) | Minor, negative, local, long term ⭘ | Moderate, negative, potentially regional, long term ◉ | Water BMP-1 | Negligible, negative, local, long term ○ |
| Water-3b: Groundwater remedial technologies effects on surface and groundwater hydrology (pump-and-treat and, to a lesser extent, heat-driven extraction) | Moderate, negative, local, long term ◉ | Moderate, negative, potentially regional, long term ◉ | Water BMP-1 | Negligible, negative, local, long term ○ |

TABLE 4.6-1
**Summary of Water Resources Impacts and Best Management Practices**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Impacts[a] | Project Alternatives[a] | | Best Management Practices [a] | Impact After Best Management Practices[a] |
|---|---|---|---|---|
| | Proposed Action | No Action | | |
| Water-3c: Groundwater remedial technologies effects on surface and GETS) | Negligible, negative, local, long term ○ | Moderate, negative, potentially regional, long term ◉ | Water BMP-1 | Negligible, negative, local, long term ○ |
| Water-4a: Soil remedial technologies effects on surface water quality range from small disturbance areas (injection wells) to much larger disturbance areas (soil extraction sites) | Moderate, negative, local, long term ◉ | Moderate, negative, potentially regional, long term ◉ | Water BMP-1 | Negligible, negative, local, long term ○ |
| Water 4b: Soil remedial technologies effects on surface water quality (introduction of chemicals via injection from in situ remediation) | Minor, negative, local, short term **○** | Moderate, negative, potentially regional, long term ◉ | Water BMP-1 | Negligible, negative, local, long term ○ |
| Water 4c: Soil remedial technologies effects on surface water quality (ex situ remediation) | Minor, negative, local, long term **○** | Moderate, negative, potentially regional, long term ◉ | Water BMP-1 | Negligible, negative, local, long term ○ |
| Water-5a: Groundwater remedial technologies effects on surface water quality could result in erosion from soil disturbance (and subsequent releases of sediment into surface waters) and potential releases of hazardous materials from construction equipment | Moderate, negative, local, long term ◉ | Moderate, negative, potentially regional, long term ◉ | Water BMP-1 | Negligible, negative, local, long term ○ |
| Water-5b: Groundwater remedial technologies effects on surface water quality (implementation of the heat-driven extraction technology) | Minor, negative, local, short term **○** | Moderate, negative, potentially regional, long term ◉ | Water BMP-1 | Negligible, negative, local, long term ○ |
| Water-6a: Groundwater quality (potential release of hazardous materials from construction equipment and range from small disturbance areas [groundwater injection wells] to much larger disturbance areas [soil extraction sites]) | Minor, negative, local, long term **○** | Moderate, negative, potentially regional, long term ◉ | Water BMP-1 | Negligible, negative, local, long term ○ |

TABLE 4.6-1

**Summary of Water Resources Impacts and Best Management Practices**

*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| | **Project Alternatives[a]** | | | |
|---|---|---|---|---|
| **Impacts[a]** | **Proposed Action** | **No Action** | **Best Management Practices [a]** | **Impact After Best Management Practices[a]** |
| Water-6b: Groundwater quality (groundwater cleanup activities would likely appreciably alter existing water quality conditions) | Moderate, beneficial, regional, long term<br>▣ | Moderate, negative, potentially regional, long term<br>⦿ | Water BMP-1 | Minor to moderate, beneficial, local, long term<br>▣ |
| **Overall Alternative Impact** | Moderate, negative, local, long term<br>⦿ | Moderate, negative, potentially regional, long term<br>⦿ | Water BMP-1 | Negligible, negative, local, long term<br>○ |
| | Moderate, beneficial, regional, long term<br>▣ | Moderate, negative, potentially regional, long term<br>⦿ | None | N/A |

Notes:
● or ■ = Significant
⦿ or ▣ = Moderate
◯ or ⧈ = Minor
○ or □ = Negligible
Circular symbols represent negative impacts while square symbols represent beneficial impacts, and the degree to which the symbol is filled represents the severity of the impact.

BMP = best management practice

[a] Potential impacts and applicable BMPs are discussed further in Sections 4.6.1 through 4.6.3.

# 4.7 Air Quality and Greenhouse Gas Emissions

This subsection describes the potential impacts on air quality and climate change (from increases in greenhouse gas [GHG] emissions) that could result from the implementation of the Proposed Action or the No Action Alternative. These impacts could be short-term increases in emissions of criteria pollutants, GHGs, and/or fugitive dust associated with proposed activities or long-term increases in emissions of criteria pollutants, GHGs, and/or fugitive dust associated with the operation of remedial technologies. The BMPs and mitigation measures that could reduce these impacts also are discussed.

The ROI for the air quality and GHG emissions includes Ventura County, which is in the South Central Coast Air Basin, and the western part of Los Angeles County, which is in the South Coast Air Basin (SCAB). For this analysis, the ROI would be expanded to also include the counties affected by the possible haul routes for demolition and environmental cleanup activities.

Section 4.7.1 includes a summary of the impact analysis to the site air quality and GHG emissions under the various soil and groundwater cleanup scenarios. Section 4.7.2 provides information about potential impacts and BMPs/mitigation measures applicable to site air quality and GHG emissions. Section 4.7.3 provides a discussion of the No Action Alternative. Section 4.7.4 includes a summary table of impacts and corresponding BMPs and mitigation measures identified in the site air quality and GHG emissions analysis. Impacts, BMPs, and mitigation measures are numbered to correspond with the summary table to indicate where impacts might occur and how BMPs and mitigation measures might offset those impacts.

Impacts on air quality and climate change associated with the Proposed Action could result from equipment, vehicles, power sources, and dust generation associated with the proposed demolition, environmental cleanup, and remedial technology operational activities. The following subsections briefly describe the methodology and assumptions used to estimate impacts from these activities, along with the thresholds to which these impacts were compared. The following descriptions identify thresholds of impact relevant to the air quality and climate change analysis:

| Impact | Description |
|---|---|
| No Impact | No impacts to air quality or climate change would be expected. |
| Negligible | Impacts would not be expected to be measurable, or would be measurable but too small to cause any change in the environment. |
| Minor | Impacts would result in a measurable change to air quality or climate change, but the change would be small and localized and of little consequence. |
| Moderate | Impacts would result in a measurable and consequential change to air quality or climate change. The impacts could be compensated for with mitigation and resources so that the impact would not be substantial. |
| Significant | Impacts would result in an extreme change to air quality or climate change; the change would be measurable and result in a severely negative or major beneficial impact. |
| Quality: | Beneficial–would have a positive effect on the physical, social, or cultural environment.<br>Negative–would have an adverse effect on the physical, social, or cultural environment. |
| Proximity: | Local–would occur within the NASA-administered property at SSFL.<br>Regional–would occur outside the NASA-administered property at SSFL. |
| Duration: | Short term–would occur only during the proposed demolition and immediate remediation period.<br>Long term–would continue beyond the proposed demolition and immediate remediation period. |

**Assumptions Used for Quantitative Analysis.** To evaluate the potential impact to air quality and climate change from demolition and environmental cleanup activities, criteria pollutant and GHG emissions were estimated from demolition and environmental cleanup equipment operation, truck travel associated with material and equipment hauling, road repairs required as a result of material and equipment hauling, and worker commutes. Fugitive dust emissions also were estimated because of demolition and earthmoving activities. Appendix H contains a more detailed description of the assumptions and data used in this analysis.

**Assumptions Used for Qualitative Analysis.** To assess the potential impact to air quality and climate change from operation of the remedial technologies, a screening assessment was performed. Technologies that would require a significant power source, use combustion, generate fugitive dust or VOC emissions, or rely on heavy-duty trucks or equipment were evaluated qualitatively based on preliminary engineering data or industry standard practices. Additionally, this evaluation considered the operational duration for each remedial technology. Tables 2.2-7 and 2.2-8 list the specific data and assumptions used in this evaluation.

**Greenhouse Gases.** Demolition and environmental cleanup related emissions would be short term; therefore, direct GHG emissions[3] were calculated but would not be expected to cause a long-term impact. Direct GHG emissions from off-road equipment and on-road vehicles were calculated following the methodology discussed for proposed activities, as detailed in Appendix H.

Operational GHG emissions, primarily a result of energy consumption or crew activity for onsite monitoring, were evaluated qualitatively. GHG emissions associated with energy consumption would be indirect GHG emissions[4] and were not quantified.

Within this analysis, annual demolition and environmental cleanup-related GHG emissions greater than 25,000 metric tons of carbon dioxide equivalent ($CO_2e$) would have a ***moderate, negative, regional***, ***and short-term*** impact on climate change, given the scale and duration of emissions. Annual operation-related GHG emissions greater than 25,000 metric tons of $CO_2e$ would have a ***significant, negative, regional,*** and ***short-term*** impact on climate change, given the scale and duration of emissions. Given the short-term effects of this project in relation to large industrial facilities, annual demolition, environmental cleanup, or operation-related GHG emissions less than 25,000 metric tons of $CO_2e$ would have a ***negligible, negative, regional,*** and ***short-term*** impact on climate change if emissions were an order of magnitude less (approximately one tenth of the threshold or less), and a ***minor, negative, regional***, and ***short-term*** impact on climate change if emissions were of the same magnitude. The actions found to have ***negligible*** or even ***minor*** impacts are not expected to affect climate change. A detailed discussion of the demolition and environmental cleanup-related climate change impacts is provided in Section 4.7.1.

**General Conformity and Applicable Thresholds.** Projects requiring approval of funding from federal agencies that are in areas designated as nonattainment or maintenance for the National Ambient Air Quality Standards (NAAQS) are subject to the U.S. Environmental Protection Agency (EPA) General Conformity Rule. Appendix I provides the full methodology and results of the General Conformity analysis, the impacts of which are considered separately for each affected nonattainment or maintenance area. Within Appendix I, the General Conformity *de minimis* threshold values[5] applicable to each affected area also are compared to the estimated project-related emissions, based on the high soil removal estimate.

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[3] Direct GHG emissions are emissions from sources within the entity's organizational boundaries that the entity owns or controls and generally result from the use of fossil fuels or other man-made chemicals (The Climate Registry [TCR], 2013).

[4] Indirect GHG emissions are a consequence of activities that take place within the organizational boundary of the entity, but occur at sources owned or controlled by another entity (TCR, 2013).

[5] Proposed Actions with emissions below the applicable *de minimis* threshold are those that are not considered to have a significant environmental impact per 40 CFR Parts 51 and 93. The *de minimis* thresholds correspond to the emission rates defined in 40 CFR 51.165-51.166 as "significant" (71 Federal Register 40420).

## 4.7.1 Proposed Action–Demolition, Soil Cleanup to Background Levels, and Groundwater Cleanup

### 4.7.1.1 Demolition

Although demolition activities and associated equipment and material hauling might occur between 2014 and the beginning of 2016, the air quality analysis conservatively assumed that activities would begin in January 2014 and be completed within 12 months. During this time, an estimated 99,134 tons of test stands, buildings, and structures would be demolished and hauled to specific facilities for export, resale, disposal, or reuse, as identified in Section 2.2. The quantity of debris generated during demolition and the number of trucks available for transport would dictate the number of haul trips, as summarized in Table 2.2-2. Appendix H provides an in-depth description of the assumptions, data, and criteria used to estimate potential impacts to air quality and climate change resulting from up to 100 percent demolition of NASA-administered structures and hauling of the demolition debris to facilities for export, resale, disposal, or reuse.

***Air Quality/General Conformity***

As listed in Table 4.7-1, emissions from demolition activities would not exceed the General Conformity *de minimis* threshold values for year 2014. Because the potential emissions from demolition activities would be below the General Conformity *de minimis* threshold values and because the emissions would be temporary, these emissions would have a ***negligible, negative, regional*****,** and ***short-term*** impact on air quality *(**Air Quality Impact-1**).*

***GHG Emissions and Climate Change***

Similarly, the GHG emissions presented in Table 4.7-2 are approximately one tenth of the CEQ threshold of 25,000 metric tons of $CO_2$e and would, therefore, have a ***negligible, negative, regional*****,** and ***short-term*** impact on climate change *(**Air Quality Impact-1**).*

***Fugitive Dust Emissions***

The estimates of particulate matter having an aerodynamic equivalent diameter of 10 microns or less ($PM_{10}$) and particulate matter having an aerodynamic equivalent diameter of 2.5 microns or less ($PM_{2.5}$), listed in Table 4.7-1, include fugitive dust emissions associated with demolition and loading haul trucks with demolition debris, which are discussed in more detail in Section 4.7.1. As discussed previously, the particulate matter levels would be below the General Conformity *de minimis* threshold values.

TABLE 4.7-1
**Proposed Action: Demolition Criteria Pollutant Emissions**
*NASA SSFL EIS for the Proposed Demolition and Environmental Cleanup*

| Emissions Location | | Criteria Pollutant Emissions (tons/year) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | **VOC** | **CO** | **NOx** | **$SO_2$** | **$PM_{10}$** | **$PM_{2.5}$** | **Lead** |
| ***Year 2014*** | | | | | | | | |
| SCCAB | Onsite | 2 | 11 | 20 | -- | 2 | 1 | -- |
| | Offsite | -- | -- | -- | -- | -- | -- | -- |
| | Total | 2 | 11 | 20 | -- | 2 | 1 | -- |
| SCAB | Offsite | -- | 1 | 3 | -- | -- | -- | -- |
| MDAB | Offsite | -- | 0 | 1 | -- | -- | -- | -- |
| GBVAB | Offsite | -- | -- | 1 | -- | -- | -- | -- |
| Nevada | Offsite | -- | -- | -- | -- | -- | -- | -- |
| ***General Conformity De Minimis Threshold Values*** | | | | | | | | |
| SCCAB | | 50 | N/A | 50 | N/A | N/A | N/A | N/A |
| SCAB | | 10 | 100 | 10 | 100 | 100 | 100 | 25 |

TABLE 4.7-1
**Proposed Action: Demolition Criteria Pollutant Emissions**
*NASA SSFL EIS for the Proposed Demolition and Environmental Cleanup*

| Emissions Location | Criteria Pollutant Emissions (tons/year) | | | | | | |
|---|---|---|---|---|---|---|---|
| | VOC | CO | NOx | $SO_2$ | $PM_{10}$ | $PM_{2.5}$ | Lead |
| MDAB | 100 | N/A | 100 | N/A | 100 | N/A | N/A |
| GBVAB | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Nevada | 100 | 100 | 100 | 100 | 70 | N/A | N/A |

Notes:
-- = annual emissions are less than 1 ton/year
CO = carbon monoxide
GBVAB = Great Basin Valley Air Basin
MDAB = Mojave Desert Air Basin
N/A = not applicable because the air basin is in attainment for that pollutant
NOx = oxides of nitrogen
PM = particulate matter less than 10 micrometers/2.5 micrometers in aerodynamic diameter
SCAB = South Coast Air Basin
SCCAB = South Central Coast Air Basin
$SO_2$ = sulfur dioxide

TABLE 4.7-2
**Proposed Action: Demolition GHG Emissions**
*NASA SSFL EIS for the Proposed Demolition and Environmental Cleanup*

| Emissions Location | | Greenhouse Gas Emissions (metric tons/year) |
|---|---|---|
| | | Carbon Dioxide Equivalent ($CO_2e$) |
| ***Year 2014*** | | |
| SCCAB | Onsite | 1,783 |
| | Offsite | 22 |
| | Total | 1,806 |
| SCAB | Offsite | 671 |
| MDAB | Offsite | 330 |
| GBVAB | Offsite | 117 |
| Nevada | Offsite | 84 |
| Year 2014 Total | | 3,007 |
| ***CEQ Threshold*** | | |
| All Air Basins | | 25,000 |

### 4.7.1.2 Soil Cleanup to Background

Of the proposed soil remedial technologies, the excavation and offsite disposal technology would use the most onsite and offsite equipment and trucks. As a result, the excavation and offsite disposal technology would be anticipated to result in the most air pollutant emissions, relative to other remedial technologies considered. This technology, therefore, was evaluated quantitatively to provide an upper bound analysis. However, the remaining soil remedial technologies, both ex situ and in situ treatments, were evaluated qualitatively. The following text provides a comparative analysis of the soil remedial technologies.

**Excavation and Offsite Disposal**

***Air Quality and General Conformity***

Excavation activities, if selected for remediation, would be expected to occur between 2016 and 2017. If the contaminated soil was determined to be untreatable, approximately 500,000 $yd^3$ of soil would be removed. It is possible that, in certain areas, soil remaining after excavation of non-treatable soil would be treatable to background levels. If this technology proved feasible, the soil removal volume would be reduced to approximately 320,000 $yd^3$. Table 4.7-3 provides the number of truckloads of soil for removal and potential backfilling operations, as well as additional information, for both the high (500,000 $yd^3$) and low (320,000 $yd^3$) soil removal estimates. Although up to one-third of the soil excavated may be replaced using backfill from either onsite areas or an offsite source, no additional equipment would be required because the excavation equipment would be used to perform backfill activities. The quantity of backfill used would be dependent on the availability of clean soil. If clean soil is not available, the site would be left as is after excavation. This analysis conservatively assumes clean soil is available to allow backfilling of up to one-third of the soil excavated.

As described in Section 2.2, five landfills were identified for possible offsite disposal of excavated soil. Although additional landfills might be identified before the onset of disposal activities, the five landfills identified for this analysis were considered representative. Material hauling to several of these landfills would require travel through several counties outside the expanded ROI identified in Section 3.5[6].

A detailed analysis was performed to evaluate whether emissions occurring in the nonattainment and maintenance areas of the counties in which project activities might occur would exceed the General Conformity *de minimis* thresholds. The emission results demonstrated that, regardless of the landfill selected, the General Conformity *de minimis* thresholds would only potentially be exceeded for areas within the expanded ROI and not in those areas excluded from the expanded ROI. Appendix I presents a detailed analysis for material hauling emissions, based on the high soil removal estimate. As detailed in Appendix H, the low soil removal estimate also would generate emissions that exceed the General Conformity *de minimis* thresholds for the same areas within the ROI, but to a lesser degree.

As listed in Table 4.7-3, the minimum frequency of truck round trips to enable completion of the excavation and offsite disposal, planned to be completed by 2017, was estimated assuming that activities would require the entire material hauling duration[7]. As described in Appendix I, this limit does not guarantee annual emissions below the General Conformity *de minimis* threshold values; however, this limit can be used to track annual truck trips as one method of verifying conformance. Because General Conformity is evaluated on a calendar-year basis, NASA would not be required to adhere to this daily limit, but instead would be required to meet the annual limit established by this daily limit for each year of activity (note that the annual limit would vary depending on days of activity per year).

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[6] The expanded ROI includes Ventura, Los Angeles, and Kern counties. Counties excluded from the expanded ROI that were still considered in this analysis include San Bernardino, Kings, and Inyo counties in California; Nye, Clark, Lincoln, White Pine, and Elko counties in Nevada; and Tooele County in Utah.

[7] The truck trips listed do not include delivery trucks, of which there may be up to an additional 60 trucks over the life of the project (20 trucks per demolition, soil treatment, and groundwater treatment phase). These additional trucks would result in negligible emissions relative to the haul truck trips and were not quantified.

TABLE 4.7-3
**Material Hauling**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Parameter | High Soil Removal Estimate | Low Soil Removal Estimate |
|---|---|---|
| Soil Removal Volume ($yd^3$) | 500,000 | 320,000 |
| Number of Removal Trucks Required [a] | 26,441 | 16,842 |
| Removal Truck Frequency (trucks per day) | 53 | 34 |
| Soil Backfill Volume ($yd^3$) [b] | 167,000 | 106,667 |
| Number of Backfill Trucks Required [a] | 8,814 | 5,614 |
| Backfill Truck Frequency (trucks per day) | 18 | 11 |
| Hauling Duration (days per years) [c] | 498/2 | 498/2 |
| Number of Stockpiles [d] | 377 | 240 |

Notes:
[a] The number of trucks required for soil removal or backfill was estimated based on the soil removal or backfill volume and a truck capacity of 19 $yd^3$.
[b] The quantity of backfill would be dependent on the availability of clean soil; this analysis conservatively assumes clean soil is available to allow backfilling of up to one-third of the soil excavated.
[c] Hauling duration (years) assumes that activities might occur over the entire material hauling duration but not necessarily on consecutive days.
[d] The average size of a stockpile was assumed to be 0.14 acre, consistent with Ventura County Air Pollution Control District (VCAPCD) Rule 74.29.

As listed in Tables 4.7-4 and 4.7-5, emissions from the excavation and offsite disposal technology, based on the high or low soil removal estimate, would exceed the SCAB General Conformity *de minimis* threshold value for NOx in years 2016 and 2017. Emissions from the excavation and offsite disposal technology, based on the high soil removal estimate only, would exceed the San Joaquin Valley Air Basin (SJVAB) General Conformity *de minimis* threshold value for NOx in years 2016 and 2017.

TABLE 4.7-4
**Proposed Action: Excavation and Offsite Disposal Criteria Pollutant Emissions for High Soil Removal Estimate**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Emissions Location | | Criteria Pollutant Emissions (tons/year) [a, b] | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | VOC | CO | NOx | $SO_2$ | $PM_{10}$ | $PM_{2.5}$ | Lead |
| ***Year 2016*** | | | | | | | | |
| SCCAB | Onsite | 1 | 9 | 13 | -- | 1,050 | 219 | -- |
| | Offsite | -- | -- | 2 | -- | -- | -- | -- |
| | Total | 1 | 9 | 15 | -- | 1,050 | 219 | -- |
| SCAB | Offsite | 1 | 4 | 20 | -- | 1 | -- | -- |
| MDAB | Offsite | 1 | 5 | 18 | -- | 1 | 1 | -- |
| SJVAB | Offsite | -- | 3 | 14 | -- | 1 | -- | -- |
| GBVAB | Offsite | -- | 1 | 6 | -- | -- | -- | -- |

TABLE 4.7-4

**Proposed Action: Excavation and Offsite Disposal Criteria Pollutant Emissions for High Soil Removal Estimate**

*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Emissions Location | | Criteria Pollutant Emissions (tons/year) [a, b] | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | VOC | CO | NOx | $SO_2$ | $PM_{10}$ | $PM_{2.5}$ | Lead |
| Nevada | Offsite | 2 | 13 | 68 | -- | 2 | 2 | -- |
| Utah | Offsite | -- | 2 | 9 | -- | -- | -- | -- |
| **Year 2017** | | | | | | | | |
| SCCAB | Onsite | 1 | 9 | 13 | -- | 1,146 | 239 | -- |
| | Offsite | -- | -- | 2 | -- | -- | -- | -- |
| | Total | 1 | 9 | 15 | -- | 1,146 | 239 | -- |
| SCAB | Offsite | 1 | 5 | 19 | -- | 1 | 1 | -- |
| MDAB | Offsite | 1 | 5 | 16 | -- | 1 | 1 | -- |
| SJVAB | Offsite | -- | 3 | 14 | -- | 1 | -- | -- |
| GBVAB | Offsite | -- | 1 | 6 | -- | -- | -- | -- |
| Nevada | Offsite | 2 | 14 | 65 | -- | 2 | 2 | -- |
| Utah | Offsite | -- | 2 | 9 | -- | -- | -- | -- |
| **General Conformity *De Minimis* Threshold Values** | | | | | | | | |
| SCCAB | | 50 | N/A | 50 | N/A | N/A | N/A | N/A |
| SCAB | | 10 | 100 | 10 | 100 | 100 | 100 | 25 |
| MDAB | | 100 | N/A | 100 | N/A | 100 | N/A | N/A |
| SJVAB | | 10 | N/A | 10 | 100 | 70 | 100 | N/A |
| GBVAB | | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Nevada | | 100 | 100 | 100 | 100 | 70 | N/A | N/A |
| Utah | | N/A | N/A | N/A | 100 | N/A | N/A | N/A |

Notes:
-- = annual emissions are less than 1 ton/year
N/A = not applicable because the air basin is in attainment for that pollutant

[a] The results presented are based on the maximum possible distance traveled in each air basin or state, regardless of which landfill is used for offsite disposal or which aggregate supplier is used to provide backfill. Emissions are likely to vary per location if only one landfill or one aggregate supplier is evaluated.

[b] Similarly, the results presented are based on the conservative assumption that clean soil is available to allow backfilling of up to one-third of the soil excavated. Emissions will be less if clean soil is not available and backfilling is not performed.

TABLE 4.7-5

**Proposed Action: Excavation and Offsite Disposal Criteria Pollutant Emissions for Low Soil Removal Estimate**

*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Emissions Location | | Criteria Pollutant Emissions (tons/year) [a, b] | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | VOC | CO | NOx | $SO_2$ | $PM_{10}$ | $PM_{2.5}$ | Lead |
| **Year 2016** | | | | | | | | |
| SCCAB | Onsite | 1 | 9 | 13 | -- | 852 | 178 | -- |
| | Offsite | -- | -- | 1 | -- | -- | -- | -- |
| | Total | 1 | 9 | 14 | -- | 852 | 178 | -- |
| SCAB | Offsite | -- | 3 | 13 | -- | 1 | -- | -- |
| MDAB | Offsite | -- | 3 | 11 | -- | 1 | -- | -- |
| SJVAB | Offsite | -- | 2 | 9 | -- | -- | -- | -- |
| GBVAB | Offsite | -- | 1 | 4 | -- | -- | -- | -- |
| Nevada | Offsite | 1 | 8 | 43 | -- | 1 | 1 | -- |
| Utah | Offsite | -- | 1 | 6 | -- | -- | -- | -- |
| **Year 2017** | | | | | | | | |
| SCCAB | Onsite | 1 | 9 | 13 | -- | 929 | 194 | -- |
| | Offsite | -- | -- | 1 | -- | -- | -- | -- |
| | Total | 1 | 9 | 14 | -- | 929 | 194 | -- |
| SCAB | Offsite | -- | 3 | 13 | -- | 1 | -- | -- |
| MDAB | Offsite | -- | 3 | 10 | -- | 1 | -- | -- |
| SJVAB | Offsite | -- | 2 | 9 | -- | -- | -- | -- |
| GBVAB | Offsite | -- | 1 | 4 | -- | -- | -- | -- |
| Nevada | Offsite | 1 | 9 | 42 | -- | 1 | 1 | -- |
| Utah | Offsite | -- | 1 | 6 | -- | -- | -- | -- |
| **General Conformity *De Minimis* Threshold Values** | | | | | | | | |
| SCCAB | | 50 | N/A | 50 | N/A | N/A | N/A | N/A |
| SCAB | | 10 | 100 | 10 | 100 | 100 | 100 | 25 |
| MDAB | | 100 | N/A | 100 | N/A | 100 | N/A | N/A |
| SJVAB | | 10 | N/A | 10 | 100 | 70 | 100 | N/A |
| GBVAB | | N/A | N/A | N/A | N/A | N/A | N/A | N/A |
| Nevada | | 100 | 100 | 100 | 100 | 70 | N/A | N/A |
| Utah | | N/A | N/A | N/A | 100 | N/A | N/A | N/A |

Notes:
-- = annual emissions are less than 1 ton/year
N/A = not applicable because the air basin is in attainment for that pollutant

[a] The results presented are based on the maximum possible distance traveled in each air basin or state, regardless of which landfill is used for offsite disposal or which aggregate supplier is used to provide backfill. Emissions are likely to vary per location if only one landfill or one aggregate supplier is evaluated.

[b] Similarly, the results presented are based on the conservative assumption that clean soil is available to allow backfilling of up to one-third of the soil excavated. Emissions will be less if clean soil is not available and backfilling is not performed.

Because the potential NOx emissions from the excavation and offsite disposal technology, based on the high or low soil removal estimate, would exceed the General Conformity *de minimis* threshold values and because the emissions would be temporary, these emissions would have a ***moderate, negative, regional,*** and ***short-term*** impact on air quality *(**Air Quality Impact-2a**).* Note that most of the emissions associated with the excavation and offsite disposal technology are from offsite emissions associated with material hauling and that, even if backfilling is not performed, emissions will still exceed the General Conformity *de minimis* threshold values, but to a lesser degree. There are no operation activities associated with this technology.

Some local roadways used by heavy vehicles to access and egress SSFL are not designated freight routes. As such, there would be an increased potential for roadway damage during material-hauling activities. As a result, roadway damage repair likely would be required periodically for the duration of the demolition and environmental cleanup period; additionally, NASA might need to coordinate travel with the roadway owners. If performed, each repair would be expected to last up to 1 month.

The project will obtain all necessary transportation permits for truck travel on city, county, and ttate roadways. Road damage likely would occur along Woolsey Canyon Road, which provides access to SSFL from offsite locations, and along several onsite roads used exclusively by NASA. Specifically, as part of Traffic MM-2, NASA would survey Woolsey Canyon Road conditions prior to the commencement of work and would repair damage caused by its demolition and cleanup activities. NASA would seek to enter into an agreement with The Boeing Company and DOE to share this repair work. Road repair would not occur along Topanga Canyon Boulevard, because it is a designated truck route. However, NASA would obtain a permit to travel along this designated truck route. Similarly, road repair would not occur along Valley Circle Boulevard and Roscoe Boulevard because these public roads are frequently used and are of a higher rating, such that the additional trucks from NASA's demolition and cleanup activities would be negligible. Trucks traveling on these public roads pay federal and state taxes and fees utilized for road maintenance, as established by the Bureau of Street Services.

In addition to the transportation permits required for the material haul trucks, the project also will comply with the applicable equipment and vehicle regulations enforced by the California Air Resources Board (ARB) and/or Ventura County Air Pollution Control District (VCAPCD). All demolition, construction, and excavation equipment, such as compressor engines, generator engines, screens, crushers, conveyors, lighting, drilling rigs, etc., shall be registered with the ARB's Portable Equipment Registration Program (PERP). In some cases, the equipment may not meet the applicability requirements of PERP (i.e., function, time at facility, etc.) and will instead be required to obtain a VCAPCD air permit. Equipment such as backhoes, bulldozers, front-end loaders, and dump trucks may not require PERP registration or a VCAPCD air permit but must comply with the ARB's Diesel Off-Road Online Reporting System Program and Regulation for In-Use Off-Road Diesel Fueled Fleets (17 California Code of Regulations 2449). If a VCAPCD air permit is required, the permit application shall comply with the best available control technology and emission offset requirements of VCAPCD Rule 26.2 (VCAPCD, 2006). The air permit application shall also demonstrate compliance with VCAPCD Rules 33, 35, and 76, as applicable (VCAPCD, 2011a; VCAPCD, 2011b; VCAPCD, 2011c).

***GHG Emissions and Climate Change***

The GHG emissions listed in Tables 4.7-6 and 4.7-7, the majority of which are from vehicles transporting soil to landfills for offsite disposal, are greater than the CEQ threshold of 25,000 metric tons of $CO_2e$ during at least 1 year and, therefore, would have a ***moderate, negative, regional,*** and ***short-term*** impact on climate change *(**Air Quality Impact-3a**).* However, if the cleanup period were extended beyond 2017, the annual GHG emissions from trucks would be less than the CEQ threshold. As noted previously, no operation activities are associated with this technology.

Although the air quality and climate change impacts for both the high and low soil removal estimates would be the same, the low soil removal estimate would generate fewer criteria pollutant and GHG emissions than the high soil removal estimate. Table 4.7-8 summarizes the percent reduction in criteria pollutant and GHG emissions achieved by using the low soil removal estimate. Similarly, fewer criteria pollutant and GHG emissions will be generated if clean soil is not available and backfilling is not performed.

TABLE 4.7-6
**Proposed Action: Excavation and Offsite Disposal GHG Emissions for High Soil Removal Estimate**
*NASA SSFL EIS for the Proposed Demolition and Environmental Cleanup*

| Emissions Location | | GHG Emissions (metric tons/year) [a, b] |
|---|---|---|
| | | $CO_2e$ |
| ***Year 2016*** [a] | | |
| SCCAB | Onsite | 1,050 |
| | Offsite | 475 |
| | Total | 1,526 |
| SCAB | Offsite | 5,065 |
| MDAB | Offsite | 6,538 |
| SJVAB | Offsite | 4,153 |
| GBVAB | Offsite | 1,953 |
| Nevada | Offsite | 16,049 |
| Utah | Offsite | 2,183 |
| | Year 2016 Total | 37,467 |
| ***Year 2017*** | | |
| SCCAB | Onsite | 1,125 |
| | Offsite | 517 |
| | Total | 1,642 |
| SCAB | Offsite | 5,514 |
| MDAB | Offsite | 7,117 |
| SJVAB | Offsite | 4,521 |
| GBVAB | Offsite | 2,126 |
| Nevada | Offsite | 17,477 |
| Utah | Offsite | 2,377 |
| | Year 2017 Total | 40,775 |
| ***CEQ Threshold*** | | |
| All Air Basins | | 25,000 |

Note:
[a] The results presented are based on the maximum possible distance traveled in each air basin or state, regardless of which landfill is used for offsite disposal or which aggregate supplier is used to provide backfill. Emissions are likely to vary per location if only one landfill or one aggregate supplier is evaluated.

[b] Similarly, the results presented are based on the conservative assumption that clean soil is available to allow backfilling of up to one-third of the soil excavated. Emissions will be less if clean soil is not available and backfilling is not performed.

TABLE 4.7-7
**Proposed Action: Excavation and Offsite Disposal GHG Emissions for Low Soil Removal Estimate**
*NASA SSFL EIS for the Proposed Demolition and Environmental Cleanup*

| Emissions Location | | GHG Emissions (metric tons/year) [a, b] |
|---|---|---|
| | | **$CO_2e$** |
| ***Year 2016*** [a] | | |
| SCCAB | Onsite | 1,050 |
| | Offsite | 307 |
| | Total | 1,357 |
| SCAB | Offsite | 3,253 |
| MDAB | Offsite | 4,165 |
| SJVAB | Offsite | 2,645 |
| GBVAB | Offsite | 1,244 |
| Nevada | Offsite | 10,222 |
| Utah | Offsite | 1,390 |
| | Year 2016 Total | 24,277 |
| ***Year 2017*** | | |
| SCCAB | Onsite | 1,125 |
| | Offsite | 333 |
| | Total | 1,458 |
| SCAB | Offsite | 3,540 |
| MDAB | Offsite | 4,534 |
| SJVAB | Offsite | 2,880 |
| GBVAB | Offsite | 1,354 |
| Nevada | Offsite | 11,132 |
| Utah | Offsite | 1,514 |
| | Year 2017 Total | 26,412 |
| ***CEQ Threshold*** | | |
| All Air Basins | | 25,000 |

Note:
[a] The results presented are based on the maximum possible distance traveled in each air basin or state, regardless of which landfill is used for offsite disposal or which aggregate supplier is used to provide backfill. Emissions are likely to vary per location if only one landfill or one aggregate supplier is evaluated.

[b] Similarly, the results presented are based on the conservative assumption that clean soil is available to allow backfilling of up to one-third of the soil excavated. Emissions will be less if clean soil is not available and backfilling is not performed.

TABLE 4.7-8

**Percent Reduction of Criteria Pollutant and GHG Emissions Achieved by Using the Low Soil Removal Estimate vs. the High Soil Removal Estimate**

*NASA SSFL EIS for the Proposed Demolition and Environmental Cleanup*

| Emissions Location | Percent Reduction by Using the Low Soil Removal Estimate [a] | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | VOC | CO | NOx | $SO_2$ | $PM_{10}$ | $PM_{2.5}$ | Lead | $CO_2e$ |
| **Year 2016** | | | | | | | | |
| SCCAB | -1% | -1% | -5% | -12% | -19% | -19% | -10% | -11% |
| SCAB | -34% | -33% | -36% | -36% | -30% | -33% | -36% | -36% |
| MDAB | -36% | -36% | -36% | -36% | -36% | -36% | -36% | -36% |
| SJVAB | -36% | -36% | -36% | -36% | -36% | -36% | -36% | -36% |
| GBVAB | -36% | -36% | -36% | -36% | -36% | -36% | -36% | -36% |
| Nevada | -36% | -36% | -36% | -36% | -36% | -36% | -36% | -36% |
| Utah | -36% | -36% | -36% | -36% | -36% | -36% | -36% | -36% |
| **Year 2017** | | | | | | | | |
| SCCAB | -1% | -1% | -5% | -12% | -19% | -19% | -10% | -11% |
| SCAB | -35% | -34% | -36% | -36% | -30% | -33% | -36% | -36% |
| MDAB | -36% | -36% | -36% | -36% | -36% | -36% | -36% | -36% |
| SJVAB | -36% | -36% | -36% | -36% | -36% | -36% | -36% | -36% |
| GBVAB | -36% | -36% | -36% | -36% | -36% | -36% | -36% | -36% |
| Nevada | -36% | -36% | -36% | -36% | -36% | -36% | -36% | -36% |
| Utah | -36% | -36% | -36% | -36% | -36% | -36% | -36% | -36% |

Note:

[a] The results presented are based on the difference between the low soil removal estimates presented in Tables 4.7-5 and 4.7-7 and the high soil removal estimates presented in Tables 4.7-4 and 4.7-6.

### *Fugitive Dust*

Fugitive dust emitted during demolition and excavation activities is likely to be dispersed some distance by winds in the vicinity of SSFL. Figures 4.7-1, 4.7-2, and 4.7-3 include wind roses demonstrating the wind characteristics in three different areas of the NASA-administered property of SSFL: the southern portion of Area II, near the former Coca Test Stand; the northern portion of Area II, near the former Incinerator; and Area I, near the former LOX Plant, respectively. As shown in these figures, the prevailing winds in the vicinity of SSFL generally blow from the southwest.

Although fugitive dust is expected to be dispersed some distance by winds, the exact distance cannot be predicted without performing air dispersion modeling. However, fugitive dust particles tend to be large and are expected to settle out of the air before they are dispersed significant distances. Therefore, fugitive dust emissions from demolition and excavation activities generally would be expected to be contained within or near the SSFL property boundary, even when considering potential dispersion by winds in the vicinity of SSFL.

The $PM_{10}$ and $PM_{2.5}$ estimates listed in Tables 4.7-4 and 4.7-5 include fugitive dust emissions associated with excavation, stockpiles, and loading haul trucks with excavated material. As addressed under the previous air quality subsection, the particulate matter levels are below the General Conformity *de minimis* threshold values. Regardless of the potential for dispersion of fugitive dust, implementation of the low soil removal estimate would

WIND ROSE PLOT:

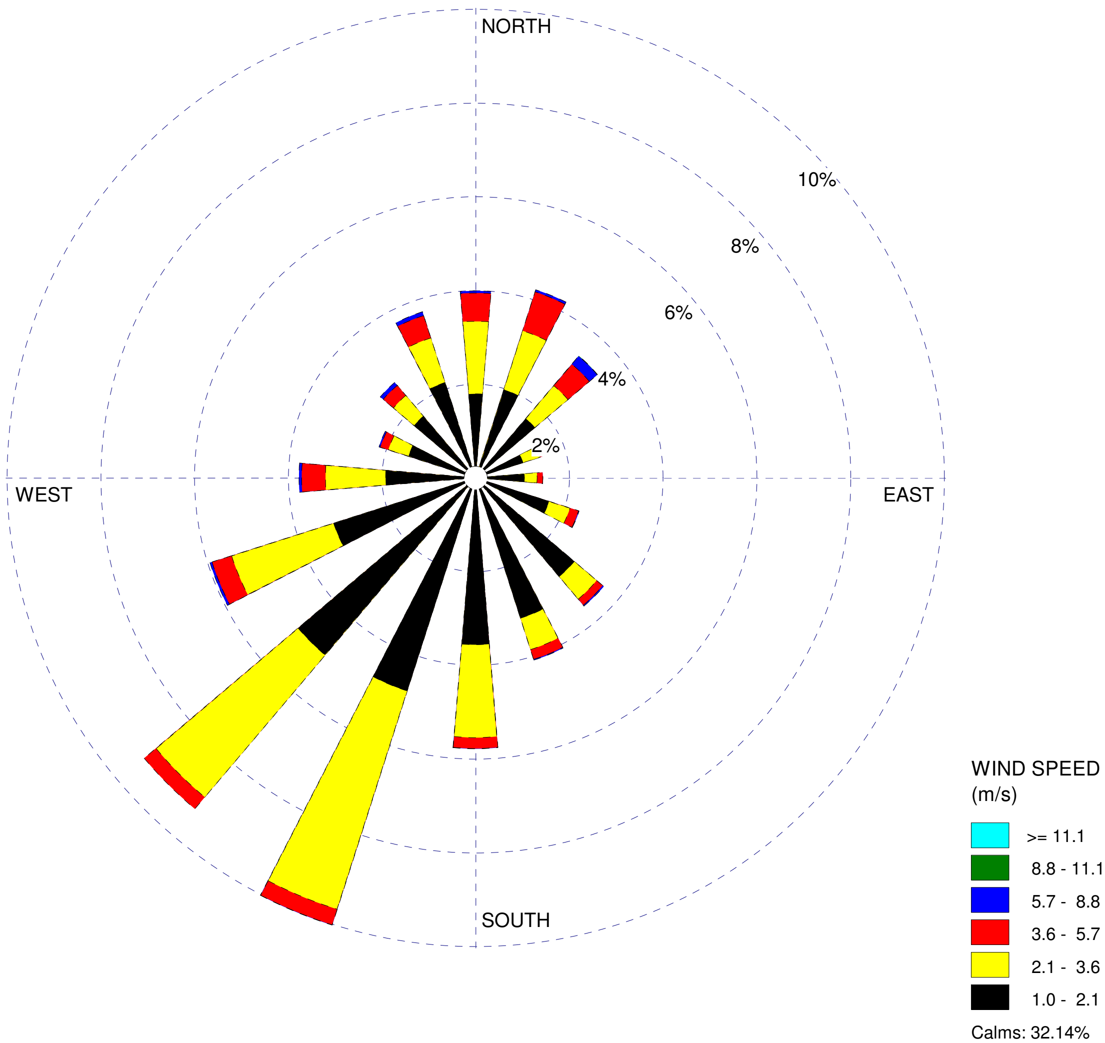
**SSFL**

**Former Coca Test Stand Location, Area II**

DISPLAY:

**Wind Speed**

**Direction (blowing from)**




COMMENTS:

This wind rose presents the localized wind effects near the former Coca Test Stand location, at an elevation of 1,915 ft.

DATA PERIOD:

**2002 2003 2004 2005 2006**
**Jan 1 - Dec 31**
**00:00 - 23:00**

COMPANY NAME:

MODELER:

CALM WINDS:

**32.14%**

TOTAL COUNT:

**43824 hrs.**

AVG. WIND SPEED:

**1.50 m/s**

DATE:

**12/20/2010**

PROJECT NO.:

WRPLOT View - Lakes Environmental Software

01-Apr-2013
Drawn By:
A. Cooley

**Figure 4.7-1**
**Wind Rose Plot for the Coca Test Stand Area**
**NASA - Santa Susana Field Laboratory**
**EIS for Proposed Demolition and Environmental Cleanup**

Map Document: O:\NASA\SSFL\maps\EIS_2011\WindRose.mxd

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WIND ROSE PLOT:

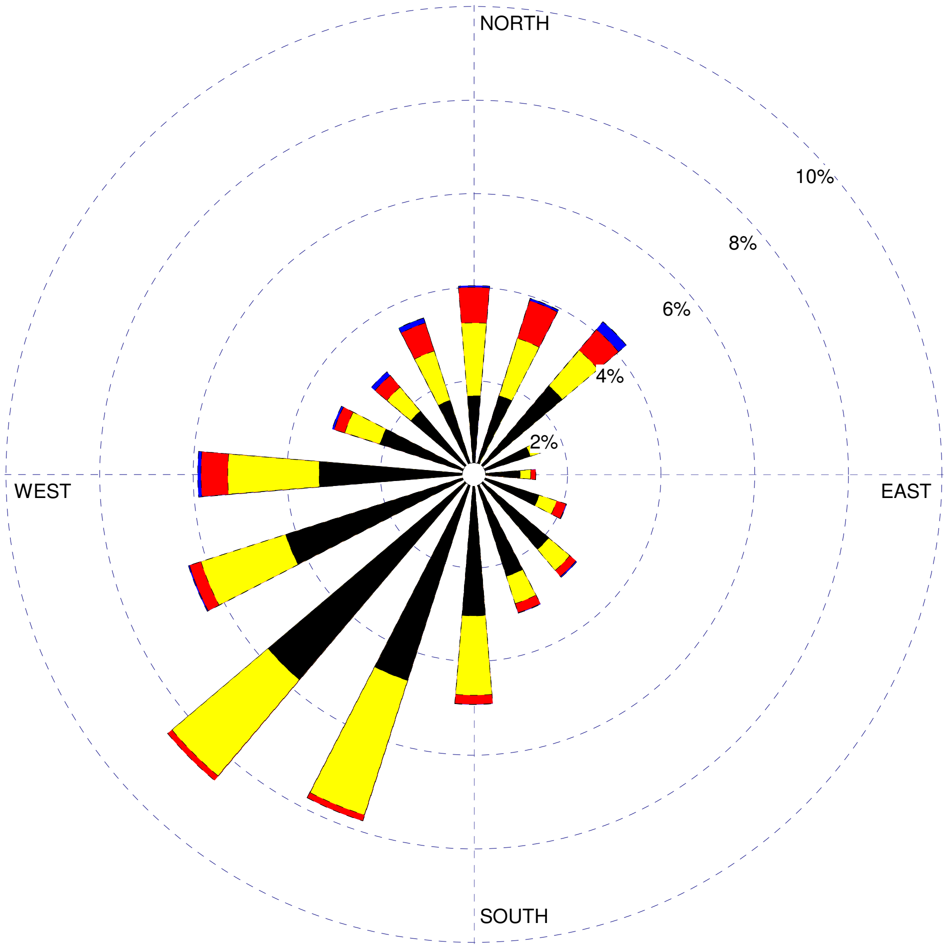
**SSFL**

**Former Incinerator Location, Area II**

DISPLAY:

**Wind Speed**

**Direction (blowing from)**




| COMMENTS: | DATA PERIOD: | COMPANY NAME: | |
|---|---|---|---|
| This wind rose presents the localized wind effects near the the former Incinerator location, at an elevation of 1,800 ft. | **2002 2003 2004 2005 2006**<br>**Jan 1 - Dec 31**<br>**00:00 - 23:00** | MODELER: | |
| | CALM WINDS:<br>**33.48%** | TOTAL COUNT:<br>**43824 hrs.** | |
| | AVG. WIND SPEED:<br>**1.44 m/s** | DATE:<br>**12/20/2010** | PROJECT NO.: |

WRPLOT View - Lakes Environmental Software

01-Apr-2013
Drawn By:
A. Cooley

**Figure 4.7-2**

**Wind Rose Plot for the Former Incinerator Location**

**NASA - Santa Susana Field Laboratory**

**EIS for Proposed Demolition and Environmental Cleanup**

Map Document: O:\NASA\SSFL\maps\EIS_2011\WindRose.mxd

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WIND ROSE PLOT:

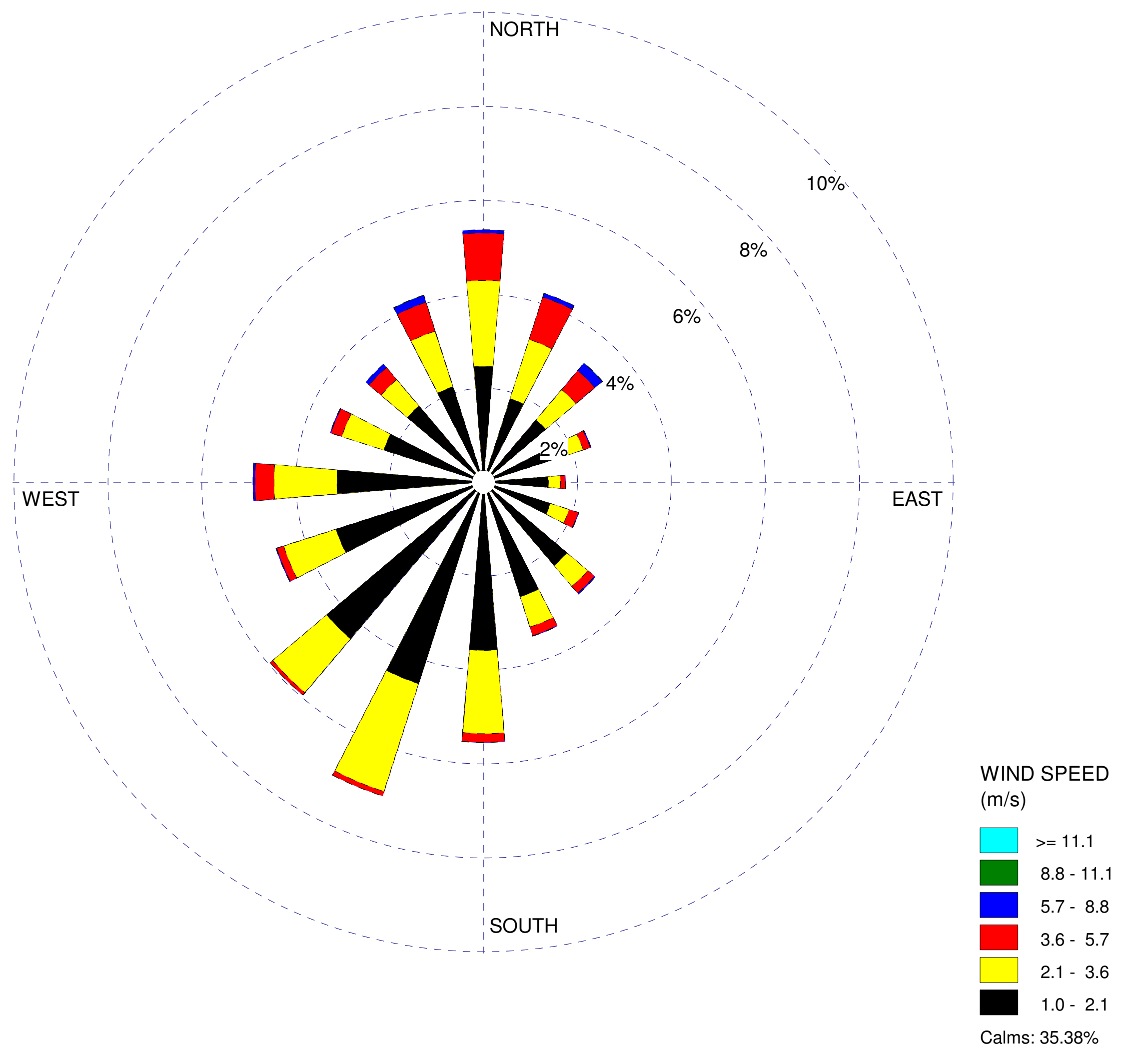
**SSFL**

**Former LOX Plant Location, Area I**

DISPLAY:

**Wind Speed**

**Direction (blowing from)**




| COMMENTS: | DATA PERIOD: | COMPANY NAME: | |
|---|---|---|---|
| This wind rose presents the localized wind effects near the the former LOX Plant location, at an elevation of 1,760 ft. | **2002 2003 2004 2005 2006**<br>**Jan 1 - Dec 31**<br>**00:00 - 23:00** | MODELER: | |
| | CALM WINDS:<br>**35.38%** | TOTAL COUNT:<br>**43824 hrs.** | |
| | AVG. WIND SPEED:<br>**1.37 m/s** | DATE:<br>**12/20/2010** | PROJECT NO.: |

WRPLOT View - Lakes Environmental Software

01-Apr-2013
Drawn By:
A. Cooley

**Figure 4.7-3**
**Wind Rose Plot for the Former LOX Plant Location**
**NASA - Santa Susana Field Laboratory**
**EIS for Proposed Demolition and Environmental Cleanup**

Map Document: O:\NASA\SSFL\maps\EIS_2011\WindRose.mxd

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result in approximately 19 percent fewer fugitive dust emissions during onsite excavation activities than implementation of the high soil removal estimate. Similarly, fewer fugitive dust emissions will be generated if clean soil is not available and backfilling is not performed.

As described in Section 2.2, soils would be stockpiled temporarily to await transport offsite. The stockpile sites would be graded to a level surface. Stockpiles would be used from the start of excavation activities to the end of material-hauling activities, which would coincide with the total material-hauling duration. Each stockpile would be limited to an area of 0.14 acre, per VCAPCD Rule 74.29 (VCAPCD, 2008b). Although not subject to South Coast Air Quality Management District (SCAQMD) Rule 1157, NASA would adhere to a stockpile height limit of 8 ft (SCAQMD, 2006), which was used to estimate the number of stockpiles.

Because the demolition and environmental cleanup activities will generate fugitive dust emissions, valley fever also may be a concern. Valley fever is caused by a fungi, Coocidiodes immitis or Coccidioides posadasii, found in arid desert soils. When the soil is disturbed, spores are released into the air and can be carried on the wind. People are exposed when they breathe in the spores. Most people who are exposed do not get sick; however, valley fever can cause flu-like symptoms and, in rare cases, cause meningitis and even death. Although more commonly found in the San Joaquin Valley (Central Valley), according to the California Department of Public Health, the soils at SSFL have not been sampled for the fungi that cause valley fever. As described previously, to meet the AOC cleanup requirements, approximately 500,000 $yd^3$ of soil will be disturbed. If cleanup alternatives other than soil removal could be used, the amount of soil disturbed would be reduced by approximately 180,000 $yd^3$ and the amount of dust emissions would be reduced by approximately 19 percent. Release of dust during remediation and demolition will be controlled by wetting the soil, limiting the stockpiles to an area of 0.14 acre and height of 8 ft, covering roads with gravel, limiting the speed of vehicles, placing tarps over or barriers around stockpiles of soil, and ceasing bulk material loading and removal activities (from trucks) during high winds or storms. After remediation, the previously vegetated areas will be planted with a native seed mix.

**Excavation and Offsite Disposal with Ex Situ Onsite Treatment**

If a portion of the contaminated soil were determined to be treatable, the following ex situ treatments might be considered for treating up to 180,000 $yd^3$ of soil left onsite after implementation of the excavation and offsite disposal technology with the low soil removal estimate. As a result, the air quality, climate change, and fugitive dust impacts discussed in the following text would be in addition to those described previously for the low soil removal estimate. Because the ex situ treatments would be in addition to the excavation and offsite disposal technology, the combined impacts to air quality and climate change would be ***moderate, negative, regional,*** and ***short term*** *(**Air Quality Impact-2a** and **3a, respectively**).*

***Soil Washing***

**Air Quality and General Conformity.** This technology would require excavation with some required offsite disposal and potential backfilling. Although the soil would be treated onsite prior to the untreatable portion being hauled offsite for disposal, treatment by washing with water would not be expected to increase onsite emissions. Therefore, the onsite and offsite emissions were estimated to be approximately half of those from the excavation and offsite disposal technology (low soil removal estimate)[8]. Consequently, the soil washing technology (as a standalone technology) would result in ***minor, negative, regional,*** and ***short-term*** impacts to air quality ***(Air Quality Impact-2b)***, which would be less than the potential impacts of the excavation and offsite disposal technology. Note that the total impacts for this technology would be combined with those associated with the excavation and offsite disposal technology (low soil removal estimate).

Operational activities for this technology would be negligible, including only crew monitoring activities. Although monitoring activities would last several months to years, the operation-related impacts to air quality would be ***negligible, negative, regional,*** and ***short term (Air Quality Impact-4a).***

[8] This evaluation assumes that the volume of excavated soil is linearly related to the resulting emissions.

**GHG Emissions and Climate Change.** The onsite and offsite emissions would be approximately half of those from the excavation and offsite disposal technology. Consequently, the soil washing technology (as a standalone technology) would result in ***minor, negative, regional,*** and ***short-term*** impacts to climate change ***(Air Quality Impact-3b)***. Note that the total impacts for this technology would be combined with those associated with the excavation and offsite disposal technology (low soil removal estimate).

Operational activities for this technology would be negligible, including only crew monitoring activities. Although monitoring activities would last several months to years, the operation-related impacts to climate change would be ***negligible, negative, regional,*** and ***short term (Air Quality Impact-4a).***

**Fugitive Dust.** Fugitive dust emissions would be present because stockpiles and offsite disposal would be used. However, these emissions would be approximately half of those from the excavation and offsite disposal technology. Although fugitive dust is expected to be dispersed some distance by winds, fugitive dust emissions generally would be expected to be contained within or near the SSFL property boundary, even when considering potential dispersion by winds in the vicinity of SSFL. As discussed in the previous air quality subsection, the minor impacts indicate that particulate matter levels would be below the General Conformity *de minimis* threshold values.

***Ex Situ Treatment Using Land Farming***

**Air Quality/General Conformity.** This technology would require excavation beyond that evaluated for the excavation and offsite disposal technology (low soil removal estimate), up to that evaluated for the excavation and offsite disposal technology (high soil removal estimate). However, in lieu of offsite disposal or potential backfilling, the additional excavated soil would be treated onsite and left in place. Therefore, assuming that up to 180,000 $yd^3$ of soil might be excavated as a result of this technology, the onsite emissions would be approximately half of those from the excavation and offsite disposal technology (low soil removal estimate) without the associated offsite emissions. Because most of the emissions associated with the excavation and offsite disposal technology (low or high soil removal estimate) are from offsite emissions associated with material hauling, the ex situ treatment using land farming technology (as a standalone technology) would result in fewer potential impacts than the excavation and offsite disposal technology (low or high soil removal estimate) but would still be considered ***minor, negative, regional,*** and ***short term*** due to the significant onsite activity ***(Air Quality Impact-2b).*** Note that the total impacts for this technology would be combined with those associated with the excavation and offsite disposal technology (low soil removal estimate).

Operational activities for this technology would be negligible, including only crew monitoring activities. Although monitoring activities would last several months to years, the operation-related impacts to air quality would be ***negligible, negative, regional,*** and ***short term (Air Quality Impact-4a).***

**GHG Emissions and Climate Change.** The onsite emissions would be approximately half of those from the excavation and offsite disposal technology (low soil removal estimate) without the associated offsite emissions. Consequently, the ex situ treatment using land farming technology (as a standalone technology) would result in fewer potential impacts than the excavation and offsite disposal technology (low or high soil removal estimate) but would still be considered ***minor, negative, regional,*** and ***short term*** due to the significant onsite activity ***(Air Quality Impact-3b).*** Note that the total impacts for this technology would be combined with those associated with the excavation and offsite disposal technology (low soil removal estimate).

Operational activities for this technology would be negligible, including only crew monitoring activities. Although monitoring activities would last several months to years, the operation-related impacts to climate change would be ***negligible, negative, regional,*** and ***short term (Air Quality Impact-4a).***

**Fugitive Dust.** Without offsite disposal, there would be no offsite emissions from this technology alone. However, onsite fugitive dust emissions would be approximately half of those from the excavation and offsite disposal technology (low soil removal estimate) because stockpiles would still be used. Although fugitive dust is expected to be dispersed some distance by winds, fugitive dust emissions generally are expected to be contained within or near the SSFL property boundary, even when considering potential dispersion by winds in the vicinity of SSFL. As discussed in the previous air quality subsection, the minor impacts indicate that particulate matter levels would be below the General Conformity *de minimis* threshold values.

***Ex Situ Treatment Using Oxidation***

**Air Quality and General Conformity.** This technology would require excavation beyond that evaluated for the excavation and offsite disposal technology (low soil removal estimate), up to that evaluated for the excavation and offsite disposal technology (high soil removal estimate). However, in lieu of stockpiling material or offsite disposal, it would include construction of a temporary structure for mixing. Without offsite disposal, there would be no offsite emissions. However, construction of the mixing structure would slightly increase onsite emissions over a short period of time. Therefore, assuming that up to 180,000 $yd^3$ of soil could be excavated as a result of this technology and that a mixing structure would be constructed, the onsite emissions would be slightly more than half of those from the excavation and offsite disposal technology (low soil removal estimate) without the associated offsite emissions. Because most of the emissions associated with the excavation and offsite disposal technology (low or high soil removal estimate) would be from offsite emissions associated with material hauling, the ex situ treatment using oxidation technology (as a standalone technology) would result in fewer potential impacts than the excavation and offsite disposal technology (low or high soil removal estimate), but would still be considered ***minor, negative, regional,*** and ***short term (Air Quality Impact-2b*****)**. Note that the total impacts for this technology would be combined with those associated with the excavation and offsite disposal technology (low soil removal estimate).

Operational activities for this technology would be negligible, including only operation of the thermal desorption chamber, once installed. Because operation of the thermal desorption chamber would only result in indirect emissions, as described in later text, the operation-related impacts to air quality would be ***negligible, negative, regional,*** and ***short term (Air Quality Impact-4a).***

**GHG Emissions and Climate Change.** Because the onsite emissions associated with the excavation and offsite disposal technology (low or high soil removal estimate) would be lower than the climate change thresholds, the small increase in emissions from construction of the mixing structure would not cause a change in the potential impacts to climate change. Consequently, the potential impacts to climate change from the ex situ treatment using oxidation technology (as a standalone technology) would be ***minor, negative, regional,*** and ***short term (Air Quality Impact-3b****)*. Note that the total impacts for this technology would be combined with those associated with the excavation and offsite disposal technology (low soil removal estimate).

Operation of the mixing structure, once installed, could require an electrical power source. The electrical source would lead to a small amount of indirect GHG emissions (GHG emissions generated offsite) associated with electricity consumption; direct GHG emissions associated with electricity consumption would already be accounted for by the power producer. As a result, the operation-related impact to climate change would be ***negligible, negative, regional,*** and ***short term (Air Quality Impact-4a****)*.

**Fugitive Dust.** Without offsite disposal, there would be no offsite emissions from this technology alone. Similarly, onsite fugitive dust emissions would be less than those associated with the excavation and offsite disposal technology (low soil removal estimate) because there would be no stockpiling. As described in the previous air quality subsection, the minor impacts indicate that particulate matter levels would be below the General Conformity *de minimis* threshold values.

***Ex Situ Treatment Using Thermal Desorption***

**Air Quality and General Conformity.** This technology would require excavation beyond that evaluated for the excavation and offsite disposal technology (low soil removal estimate), up to that evaluated for the excavation and offsite disposal technology (high soil removal estimate), and the same level of construction as that evaluated for the ex situ treatment using oxidation technology. As with the ex situ treatment using oxidation technology, the ex situ treatment using thermal desorption technology would include construction of a temporary thermal desorption chamber, but would have no emissions associated with stockpiling or offsite disposal. Construction activities associated with the ex situ treatment using thermal desorption technology (as a standalone technology) would result in the same potential impacts to air quality as from the ex situ treatment using oxidation technology, which would be ***minor, negative, regional,*** and ***short term*** *(**Air Quality Impact-2b**).* Note that the total impacts for this technology would be combined with those associated with the excavation and offsite disposal technology (low soil removal estimate).

Similarly, operational activities associated with the ex situ treatment using thermal desorption technology would result in the same potential impacts to air quality as the ex situ treatment using oxidation technology, which would be ***negligible, negative, regional,*** and ***short term*** *(**Air Quality Impact-4a**)*. Additionally, if the treatment system was found to emit VOCs and SVOCs to the atmosphere during operation, an air permit might be required, which would generate ***negligible, negative, local,*** and ***short-term*** impacts to air quality *(**Air Quality Impact-5**).*

**GHG Emissions and Climate Change.** Construction activities associated with the ex situ treatment using thermal desorption (as a standalone technology) would result in the same potential impacts to climate change as from the ex situ treatment using oxidation technology, which would be ***minor, negative, regional***, and ***short term*** ***(Air Quality Impact-3b)***. Note that the total impacts for this technology would be combined with those associated with the excavation and offsite disposal technology (low soil removal estimate).

Similarly, operational activities associated with the ex situ treatment using thermal desorption technology would result in the same potential impacts to climate change as the ex situ treatment using oxidation technology, which would be ***negligible, negative, regional,*** and ***short term*** *(**Air Quality Impact-4a**).*

**Fugitive Dust.** Without offsite disposal, there would be no offsite emissions from this technology alone. Similarly, onsite fugitive dust emissions would be less than those associated with the excavation and offsite disposal technology (low soil removal estimate) because there would be no stockpiling. As discussed in the previous air quality subsection, the minor impacts indicate that particulate matter levels would be below the General Conformity *de minimis* threshold values.

**Excavation and Offsite Disposal with In Situ Onsite Treatment**

As with the ex situ treatments, the following in situ treatments might be considered for treating up to 180,000 $yd^3$ of soil left onsite after implementation of the excavation and offsite disposal technology with the low soil removal estimate. As a result, the air quality, climate change, and fugitive dust impacts discussed in the following text would be in addition to those discussed previously for the low soil removal estimate. Because the in situ treatments would be in addition to the excavation and offsite disposal technology, the combined impacts to air quality and climate change would be at least ***moderate, negative, regional,*** and ***short term*** *(**Air Quality Impact-2a** and **3a**, respectively).*

***Soil Vapor Extraction***

**Air Quality and General Conformity.** Although this technology would require the construction of SVE wells, construction would require much less onsite equipment and be shorter in duration than the activities associated with excavation, and would not require the haul trucks needed for additional offsite disposal. Therefore, the potential impacts to air quality from the construction of the SVE technology (as a standalone technology) would be ***negligible, negative, regional,*** and ***short term*** *(**Air Quality Impact-2c**)*, which is less than the potential impacts associated with the excavation and offsite disposal technology (low soil removal estimate). Note that the total impacts for this technology would be combined with those associated with the excavation and offsite disposal technology (low soil removal estimate).

Because the SVE system would emit VOCs to the atmosphere during operation, an air permit would be required. The application of air pollution control equipment could reduce VOC emissions. Per VCAPCD Rule 26.2, offsets would be required if VOC emissions were greater than 5 tons per year (VCAPCD, 2006). Operation could last several months to years; however, the VOC emissions would be limited, thus resulting in a ***negligible, negative, local,*** and ***short-term*** impact to air quality *(**Air Quality Impact-5**).*

**GHG Emissions and Climate Change.** As noted previously, this technology would require the construction of SVE wells, but would need much less onsite equipment than the activities associated with excavation, and would not require the haul trucks needed for offsite disposal. Therefore, the potential impacts to climate change from the construction of the SVE technology (as a standalone technology) would be ***negligible, negative, regional,*** and

***short term (Air Quality Impact-3c)***, which is less than the potential impacts associated with the excavation and offsite disposal technology (low soil removal estimate). Note that the total impacts for this technology would be combined with those associated with the excavation and offsite disposal technology (low soil removal estimate).

Operation of the SVE system, once installed, would require an electrical power source. The electrical source would lead to a small amount of indirect GHG emissions (GHG emissions generated offsite) associated with electricity consumption; direct GHG emissions associated with electricity consumption would already be accounted for by the power producer. As a result, the operation-related impact to climate change would be ***negligible, negative, regional,*** and ***short term (Air Quality Impact-4a)***. Operation of the SVE system is not expected to change the climate.

**Fugitive Dust.** Because there would be no excavation associated with this technology alone, there would be ***negligible*** fugitive dust impacts. As discussed in the previous air quality subsection, the ***negligible*** impacts indicate that particulate matter levels would be below the General Conformity *de minimis* threshold values.

***In Situ Chemical Oxidation***

**Air Quality and General Conformity.** This technology would require the construction of injection wells using onsite construction equipment. However, this construction would require much less onsite equipment and would be shorter in duration than the activities associated with excavation, and would not require the haul trucks associated with offsite disposal. Therefore, the potential impacts to air quality from construction of the in situ chemical oxidation technology (as a standalone technology) would be less than the potential impacts associated with the excavation and offsite disposal technology (low soil removal estimate), resulting in ***negligible, negative, regional,*** and ***short-term*** impacts to air quality ***(Air Quality Impact-2c).*** Note that the total impacts for this technology would be combined with those associated with the excavation and offsite disposal technology (low soil removal estimate).

Once installed, there would be no ongoing operation activities associated with the in situ chemical oxidation system. A high-pressure gas (usually nitrogen) could be used in conjunction with the in situ chemical oxidation system to fracture the soil pneumatically to enhance fluid injection. If this technology were implemented, there would be ***negligible, negative, local,*** and ***short-term*** impacts to air quality ***(Air Quality Impact-5).***

**GHG Emissions and Climate Change.** As noted previously, this technology would require the construction of injection wells using much less onsite construction equipment than the activities associated with excavation, and would not require the haul trucks associated with offsite disposal. Therefore, the potential impacts to climate change from construction of the in situ chemical oxidation technology (as a standalone technology) would be less than the potential impacts associated with the excavation and offsite disposal technology (low soil removal estimate), resulting in ***negligible, negative, regional,*** and ***short-term*** impacts to climate change ***(Air Quality Impact-3c)***. Note that the total impacts for this technology would be combined with those associated with the excavation and offsite disposal technology (low soil removal estimate).

As noted previously, there would be no ongoing operation activities associated with the in situ chemical oxidation system, once installed. If a high-pressure gas was used in conjunction with the in situ chemical oxidation system, there would be ***negligible, negative, local,*** and ***short-term*** impacts to climate change ***(Air Quality Impact-5).***

**Fugitive Dust.** Because there would be no excavation or stockpiling associated with this technology alone, there would be negligible fugitive dust impacts. As addressed under air quality above, the negligible impacts indicate that particulate matter levels are below the General Conformity *de minimis* threshold values.

***In Situ Anaerobic or Aerobic Biological Treatment***

**Air Quality and General Conformity.** This technology would require the construction of injection wells using onsite construction equipment. However, this construction would require much less onsite equipment and be shorter in duration than the activities associated with excavation, and would not require the haul trucks associated with offsite disposal. Therefore, the potential impacts to air quality from construction of the in situ anaerobic or aerobic biological treatment technology (as a standalone technology) would be less than the potential impacts associated with the excavation and offsite disposal technology (low soil removal estimate), resulting in ***negligible, negative, regional,*** and ***short-term*** impacts to air quality ***(Air Quality Impact-2c).*** Note that the total impacts for this technology would be combined with those associated with the excavation and offsite disposal technology (low soil removal estimate).

Operation of the biological treatment system, once installed, would require only periodic monitoring activities, which likely would last several months to years. Although the monitoring duration could take up to several years, the operation emissions would be small. As a result, operation-related impacts to air quality would be ***negligible, negative, regional,*** and ***short term (Air Quality Impact-4a)***.

**GHG Emissions and Climate Change.** As noted previously, this technology would require the construction of injection wells using much less onsite construction equipment than the activities associated with excavation, and would not require the haul trucks associated with offsite disposal. Therefore, the potential impacts to climate change from construction of the in situ anaerobic or aerobic biological treatment technology (as a standalone technology) would be less than the potential impacts associated with the excavation and offsite disposal technology (low soil removal estimate), resulting in ***negligible, negative, regional,*** and ***short-term*** impacts to climate change ***(Air Quality Impact-3c).*** Note that the total impacts for this technology would be combined with those associated with the excavation and offsite disposal technology (low soil removal estimate).

As noted above, emissions associated with operation of the biological treatment system, once installed, would be small. As a result, operation-related impacts to climate change would be ***negligible, negative, regional,*** and ***short term (Air Quality Impact-4a).***

**Fugitive Dust.** Because there would be no excavation or stockpiling associated with this technology alone, there would be ***negligible*** fugitive dust impacts. As described in the previous air quality subsection, the ***negligible*** impacts indicate that particulate matter levels are below the General Conformity *de minimis* threshold values.

#### 4.7.1.3 Groundwater Cleanup

The impacts to air quality and climate change from the groundwater remedial technologies are described qualitatively in the following text in relation to the excavation and offsite disposal technology (low or high soil removal estimate). Because these technologies are directed at groundwater, their impacts would not be combined with the impacts of the excavation and offsite disposal technology (low soil removal estimate). However, NASA is required to cleanup soil and groundwater, such that the Proposed Action selected would need to identify technologies for both media.

**Pump and Treat**

This technology would require the construction of an aboveground pipeline, to transfer additional water to the existing GETS, using onsite construction equipment. It was assumed that construction of the pipeline would require much less onsite equipment than the equipment associated with excavation. The limited equipment required for construction of the pipeline would cause fewer potential onsite emissions and impacts than the excavation and offsite disposal technology, resulting in ***negligible, negative, regional,*** and ***short-term*** impacts to air quality and climate change ***(Air Quality Impacts-2c*** and ***3c***, respectively***).***

Operation of the GETS would likely be increased to accommodate higher volumes of water incoming from the new pipeline. Operation of the GETS, with increased operational capacity, would continue to require an electrical power source. The electrical source would lead to a small amount of indirect GHG emissions (GHG emissions generated offsite) associated with electricity consumption; direct GHG emissions associated with electricity consumption would already be accounted for by the power producer. As a result, the operation-related impacts to climate change would be ***negligible, negative, regional,*** and ***short term (Air Quality Impact-4a).***

NASA already operates a GETS at SSFL with the appropriate air and water discharge permits. Because this technology might include increased operation of the existing GETS, the potential need for modifications to the existing air and water discharge permits would be evaluated.

**Vacuum Extraction**

This technology would require the construction of extraction wells using onsite construction equipment. It was assumed that construction of the extraction wells would require much less onsite equipment than the equipment associated with excavation. The limited equipment required for construction of the extraction wells would cause fewer potential onsite emissions and impacts than the excavation and offsite disposal technology, resulting in ***negligible, negative, regional,*** and ***short-term*** impacts to air quality and climate change *(**Air Quality Impacts-2c** and **3c**, respectively).*

Operation of the vacuum extraction system, once installed, would require an electrical power source and thus result in similar ***negligible, negative, regional,*** and ***short-term*** impacts to climate change as the Pump-and-Treat technology *(**Air Quality Impact-4a**).*

Although treated groundwater would be injected back into the subsurface, a small quantity of VOCs in treated vapors potentially could be emitted to the atmosphere during operation. Therefore, an air permit would be required. Per VCAPCD Rule 26.2, offsets would be required if VOC emissions were greater than 5 tons per year (VCAPCD, 2006). Although operation could last several months to years, the VOC emissions would be small, less than 5 tons per year, resulting in ***negligible, negative, local,*** and ***short-term*** impacts to air quality *(**Air Quality Impact-5**).*

**Heat-driven Extraction**

This technology would have the same potential ***negligible, negative, regional,*** and ***short-term*** construction-related impacts to air quality and climate change as the vacuum extraction technology *(**Air Quality Impacts-2c*** and ***3c***, respectively*).* This technology also would have the same potential ***negligible, negative, regional,*** and ***short-term*** operation-related impacts to air quality and climate change as the vacuum extraction technology ***(Air Quality Impacts-4a)***. Because a small quantity of VOCs could be emitted to the atmosphere during operation, an air permit would be required.

**In Situ Chemical Oxidation**

This technology would require the construction of injection wells using onsite construction equipment. It was assumed that construction of the injection wells would require much less onsite equipment than the equipment associated with excavation. The limited equipment required for construction of the injection wells would cause fewer potential onsite emissions and impacts than the excavation and offsite disposal technology, resulting in ***negligible, negative, regional,*** and ***short-term*** impacts to air quality and climate change *(**Air Quality Impacts-2c*** and ***3c***, respectively*).*

Operation of the in situ chemical oxidation system, once installed, would require periodic monitoring activities, which likely would last several months to years. Although the monitoring duration could take up to several years, the operation emissions would be small. As a result, operation-related impacts to air quality and climate change would be ***negligible, negative, regional,*** and ***short term (Air Quality Impact-4a)***.

A compressed gas (usually nitrogen) could be used in conjunction with the in situ chemical oxidation system to fracture the soil pneumatically to enhance fluid injection. If this technology were implemented, there would be ***negligible, negative, local,*** and ***short-term*** construction- and operation-related impacts to air quality and climate change ***(Air Quality Impact-5).***

**In Situ Enhanced Bioremediation**

This technology would have the same potential ***negligible, negative, regional,*** and ***short-term*** construction-related impacts to air quality and climate change as the in situ chemical oxidation technology **(*Air Quality Impacts-2c*** and ***3c***, respectively*).* This technology would also have the same potential ***negligible, negative, regional,*** and ***short-term*** operation-related impacts to climate change as the in situ chemical oxidation technology ***(Air Quality Impact-4a)****.*

A compressed gas (usually nitrogen) could be used in conjunction with the in situ enhanced bioremediation system to fracture the soil pneumatically to enhance fluid injection. If this technology were implemented, there would be ***negligible, negative, local,*** and ***short-term*** construction- and operation-related impacts to air quality and climate change *(**Air Quality Impact-5**).*

**Monitored Natural Attenuation**

This technology would require construction of groundwater monitoring wells using onsite construction equipment. Exhaust emissions associated with the construction equipment would be similar to exhaust emissions associated with the construction of the extraction and injection wells required for the other groundwater remediation technologies. Therefore, because construction of the extraction wells would be short term, the construction-related impacts to air quality and climate change would be similar to the ***negligible, negative, regional,*** and ***short-term*** impacts of the other groundwater remediation technologies *(**Air Quality Impacts-2c*** and ***3c***, respectively*).*

The only expected operation emissions would be associated with crew monitoring activities, which would be expected to last throughout the lifetime of the natural attenuation processes and could take hundreds of years. Although the monitoring duration would be long, the operation emissions would be small. As a result, the potential impacts to air quality and climate change would be ***negligible, negative, regional,*** and ***long term*** *(**Air Quality Impact-4b**).*

## 4.7.2 Best Management Practices and Mitigation Measures

This subsection provides a brief description of impacts previously discussed in detail, along with corresponding mitigation measures and BMPs. BMPs are defined as actions required by law or an industry standard included in the Proposed Action activities. Mitigation is an action that would benefit the environment, but must be agreed to by agency stakeholders and NASA. Agreed-upon mitigation measures would be provided in the ROD. These impacts, BMPs, and mitigation measures are numbered to correspond to the impact summary table provided in Section 4.7.4.

This subsection provides fugitive dust[9] BMPs that are prescribed by VCAPCD Rule 55 (VCAPCD, 2008a), as currently implemented by NASA as part of its ISRA program (NASA, 2010b), and VCAPD Rule 74.29 (VCAPCD, 2008b) and listed in the following text. The BMP is numbered corresponding to the impact summary provided in Section 4.7.4.

***Air Quality BMP-1:*** Fugitive dust emissions would be controlled by measures prescribed by VCAPCD Rule 55 (VCAPCD, 2008a), which currently are implemented by NASA as part of its ISRA program (NASA, 2010b), and by VCAPCD Rule 74.29 (VCAPCD, 2008b), some of which are consistent with VCAPCD Rule 55. The relevant measures available to reduce both onsite and offsite fugitive dust emissions are summarized in the following bullets; implementation of these measures would be further described in the Dust Control Plan:

- ***Unpaved Roads***: Cover road with a low-silt content material such as recycled road base or gravel to a minimum of 4 inches or reduce speed to 15 miles per hour (mph); restrict public access; and treat with water, mulch, or a non-toxic chemical dust suppressant that complies with the applicable air and water quality government standards. It is expected that reduced vehicle speeds could reduce fugitive dust emissions by up to 57 percent, whereas application of water or non-toxic dust suppressants could reduce fugitive dust emissions by up to 55 and 84 percent, respectively (Countess Environmental, 2006).
- ***Stockpiles***: Enclose material in a three- or four-sided barrier equal to the height of the material; apply water at a sufficient quantity and frequency to prevent wind-driven dust; apply a non-toxic dust suppressant that complies with the applicable air and water quality government standards; or install and anchor tarps, plastic, or other material. It is expected that enclosure of the material could reduce fugitive dust emissions by up to 75 percent, whereas application of water or non-toxic dust suppressants could reduce fugitive dust emissions by up to 90 percent (Countess Environmental, 2006).

[9] For purposes of this BMP, fugitive dust is intended to represent loose, contaminated soil. As such, fugitive dust emissions may result in emissions of particulates ($PM_{10}$ and $PM_{2.5}$) as well as emissions of VOCs and toxic air contaminants.

- ***Material Loading***: Load materials carefully to minimize the potential for spills or dust creation. Implement water spraying as needed to suppress potential dust generation during loading operations. Take care to apply dust suppression water to the top of the load or source material to avoid wetting the truck tires. Do not perform loading during unfavorable weather conditions (such as high winds or storms). Material spilled during loading would be collected for subsequent loading. After loading, trucks would pass through the decontamination and inspection station before weighing and departure from SSFL. Decontaminate trucks by dry brushing before they leave the staging and loading areas to prevent track out. Materials from the truck decontamination would be collected and hauled out with the last load of soil. It is expected that application of water during loading operations could reduce fugitive dust emissions by up to 69 percent, whereas ceasing loading operations during unfavorable weather conditions could reduce fugitive dust emissions by up to 98 percent (Countess Environmental, 2006). Fugitive dust emissions after loading would be addressed through the paved road measures described in the following text.
- ***Material Hauling***: Use properly secured tarps that cover the entire surface area of the load or use a container-type enclosure, maintain a minimum of 6 inches of freeboard, or water or otherwise treat the bulk material to minimize loss of material to wind or spillage. It is expected that use of secured tarps and maintaining 6 inches of freeboard could reduce fugitive dust emissions by up to 91 percent, whereas watering bulk materials could reduce fugitive dust emissions by up to 69 percent (SCAQMD, 2007). Fugitive dust emissions during offsite material hauling would be further minimized by the paved road measures described in the following text.
- ***Paved Roads:*** Install a pad near the SSFL exit consisting of washed gravel to a depth of at least 6 inches, extending at least 30 ft wide and 50 ft long; pave the surface near the SSFL exit at least 100 ft long and 20 ft wide; use a rumble grate to remove bulk material from tires and vehicle undercarriages before vehicles exit SSFL; or install and use a wheel washing system to remove bulk material from tires and vehicle undercarriages before vehicles exit SSFL. It is expected that installation of a pad or paved surface could reduce fugitive dust emissions by up to 46 percent whereas installation of a rumble grate or wheel washing system could reduce fugitive dust emissions by up to 80 percent (Countess Environmental, 2006).
- ***Soil Aeration:*** Use a certified organic vapor analyzer at least once every 15 minutes during excavation and grading activities to confirm the aeration of contaminated soil is minimized or prevented. Records must be kept throughout the environmental cleanup period, consistent with VCAPCD Rule 74.19 (VCAPCD, 2008b).

The greater the amount of soil disturbed by any of these methods, the greater the amount of contaminated fugitive dust that would be released. Although no fugitive dust control technology is likely to be 100 percent effective, implementation of ***Air Quality BMP-1*** would reduce the amount of contaminated fugitive dust that might travel beyond the boundaries of SSFL. To that end, implementation of ***Air Quality BMP-1*** would maintain, although at lower levels, fugitive dust emissions below the General Conformity *de minimis* threshold values such that impacts to air quality identified in ***Air Quality Impacts-1, 2a, 2b, 2c, 4a,*** and ***4b*** would remain ***minor*** or ***negligible, negative, regional,*** and ***short term***.

***Air Quality Mitigation Measure-1:*** This mitigation measure specifically applies to the ***moderate, negative, regional,*** and ***short-term*** impacts to air quality associated with ***Air Quality Impact-2a***. To conform to the General Conformity Rule, NASA could purchase NOx offsets for the affected counties (counties in which the General Conformity *de minimis* threshold values were exceeded). The quantity of NOx offsets purchased by NASA would equal the quantity by which the General Conformity *de minimis* threshold values were exceeded (Tables 4.7-4 and 4.7-5), which would be verified by adhering to an annual truck limit based on the daily truck frequencies presented in Table 4.7-3. With this commitment to conform, the potential emissions from the excavation and offsite disposal technology or the soil washing technology would be below the corresponding General Conformity *de minimis* threshold values and the ***moderate*** air quality impacts would be reduced to ***minor, negative, regional,*** and ***short term (Air Quality Impact-2a)***.

***Air Quality Mitigation Measure-2:*** Specific to ***Air Quality Impact-3a***, the ***moderate, negative, regional***, and ***short-term*** impacts to climate change largely would result from exhaust emissions released during material hauling over lengthy routes, with a smaller contribution from exhaust emissions released during construction equipment operation. To the extent feasible and to reduce GHG emissions associated with material hauling and construction equipment, NASA might consider using newer model-year haul trucks or alternative-fueled construction equipment, which would have a co-benefit of reducing criteria pollutant emissions as well as GHG emissions. Implementation of ***Air Quality Mitigation Measure-2*** would reduce ***moderate*** climate change impacts to ***minor*** or ***negligible, negative, regional,*** and ***short term****.*

***Air Quality Mitigation Measure-3:*** NASA would develop a Dust Control Plan for the project to protect soils from wind erosion and prevent future fugitive dust emissions to the extent feasible. As described in Section 4.9, dust monitors would be installed around the work site to monitor the amount of airborne dust. The air monitors could be equipped to record dust levels on a specified interval and have an alarm that will notify workers if dust levels reach a specified level. After project activities were completed in an area, approved native seed mix would be planted to replace native vegetation destroyed during excavations, road construction, soil remediation, and other activities (new vegetation would not be planted in areas that did not have plants previously). Restoring the native vegetation would prevent soil erosion which promotes fugitive dust emissions. Implementation of ***Air Quality Mitigation Measure-3*** would maintain, although at lower levels, fugitive dust emissions below the General Conformity *de minimis* threshold values such that impacts to air quality identified in ***Air Quality Impacts-1, 2a, 2b, 2c, 4a,*** and ***4b*** would remain ***minor*** or ***negligible, negative, regional,*** and ***short term****.*

## 4.7.3 No Action Alternative

Because proposed activities, including demolition, excavation, and material hauling, would not occur under the No Action Alternative, there would be no onsite or offsite impacts to air quality and climate change.

However, the No Action Alternative would have operation-related emissions. These emissions would stem from crew activities necessary for water sampling and operation of the existing GETS, which would include indirect GHG emissions from a power supply. Because the existing GETS is smaller than the GETS with increased operational capacity, the operation-related emissions under the No Action Alternative would be less than those considered under the Proposed Action, resulting in ***negligible, negative, regional,*** and ***short-term*** impacts to air quality and climate change *(****Air Quality Impacts-3a*** and ***4a***, respectively). Similarly, activities associated with the ongoing ISRA program, Northern Drainage restoration, and general maintenance activities would continue; however, the emissions would be short term and operations would follow the existing activity-specific management plans and SWPPP BMPs.

Because the ongoing activities under the No Action Alternative target only VOCs and SVOCs, other contaminants potentially trapped in the soil and groundwater would remain in place or attenuate naturally over time. As a result, onsite exposure to contaminants might remain a concern or, at a minimum, be a prolonged concern under the No Action Alternative.

## 4.7.4 Summary of Impacts, Best Management Practices, and Mitigation Measures

Table 4.7-9 summarizes the potential impacts, BMPs, and mitigation measures applicable to air quality and climate change and fugitive dust emissions, as discussed throughout this section. Previous numbering of impacts, mitigation measures, and BMPs correspond to Table 4.7-9. The specific mitigation measures and BMPs and corresponding impacts are provided, followed by a resulting impact level if the mitigation measures and BMPs are applied successfully. Table 4.7-9 concludes with an overall alternative impact level, based on the highest level of impact identified in the analysis.

TABLE 4.7-9
**Summary of Air Quality and Greenhouse Gas Emissions Impacts, Best Management Practices, and Mitigation Measures**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Impacts [a] | Project Alternatives [a] | | Best Management Practices and Mitigation Measures[a] | Impact After Best Management Practices and Mitigation Measures Implementation[a] |
|---|---|---|---|---|
| | **Proposed Action** | **No Action** | | |
| Air Quality-1: Criteria pollutant and GHG emissions resulting from proposed demolition | Negligible, negative, regional, short term<br>○ | No impact<br>▽ | Air Quality BMP-1<br>Air Quality MM-1 | No change to impacts but maintain fugitive dust emissions below the General Conformity *de minimis* threshold values [b]<br>○ |
| Air Quality-2a: Criteria pollutant emissions causing environmental cleanup-related impacts to air quality (excavation and offsite disposal technology) | Moderate, negative, regional, short term<br>◉ | No impact<br>▽ | Air Quality BMP-1<br>Air Quality MM-1<br>Air Quality MM-3 | BMP-1: No change to impacts but maintain fugitive dust emissions below the General Conformity *de minimis* threshold values [b]<br>MM-1: Minor, negative, regional, short term<br>MM-3: No change to impacts, but maintain fugitive dust emissions below the General Conformity *de minimis* threshold values [b]<br>◉ |
| Air Quality-2b: Criteria pollutant emissions causing environmental cleanup-related impacts to air quality (Technologies requiring additional excavation, excludes excavation and offsite disposal technology) | Minor, negative, regional, short term<br>⭘ | No impact<br>▽ | Air Quality BMP-1<br>Air Quality MM-3 | No change to impacts but maintain fugitive dust emissions below the General Conformity *de minimis* threshold values [b]<br>⭘ |
| Air Quality-2c: Criteria pollutant emissions causing environmental cleanup-related impacts to air quality (Technologies not requiring additional excavation) | Negligible, negative, regional, short term<br>○ | No impact<br>▽ | Air Quality BMP-1<br>Air Quality MM-3 | No change to impacts but maintain fugitive dust emissions below the General Conformity *de minimis* threshold values [b]<br>○ |

 

TABLE 4.7-9

**Summary of Air Quality and Greenhouse Gas Emissions Impacts, Best Management Practices, and Mitigation Measures**

*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Impacts [a] | Project Alternatives [a] | | Best Management Practices and Mitigation Measures[a] | Impact After Best Management Practices and Mitigation Measures Implementation[a] |
|---|---|---|---|---|
| | Proposed Action | No Action | | |
| Air Quality-3a: GHG emissions causing environmental cleanup-related impacts to climate change (excavation and offsite disposal technology) | Moderate, negative, regional, short term<br>◉ | Negligible, negative, regional, short term<br>○ | Air Quality MM-2 | Minor to negligible, negative, regional, short term<br>◉ |
| Air Quality-3b: GHG emissions causing environmental cleanup-related impacts to climate change (Technologies requiring additional excavation, excludes excavation and offsite disposal technology) | Minor, negative, regional, short term<br>**○** | No impact<br>▽ | Air Quality MM-2 | Minor to negligible, negative, regional, short term<br>**○** |
| Air Quality-3c: GHG emissions causing environmental cleanup-related impacts to climate change (Technologies not requiring additional excavation) | Negligible, negative, regional, short term<br>○ | No impact<br>▽ | Air Quality MM-2 | Negligible, negative, regional, short term<br>○ |
| Air Quality-4a: Criteria pollutant and GHG emissions causing operation-related impacts to air quality and climate change (All technologies except those specified in Air Quality-4b) | Negligible, negative, regional, short term<br>○ | Negligible, negative, regional, short term<br>○ | Air Quality BMP-1<br>Air Quality MM-2<br>Air Quality MM-3 | BMP-1: No change to impacts but maintain fugitive dust emissions below the General Conformity *de minimis* threshold values [b]<br>MM-2 and MM-3: Impacts would remain negligible.<br>○ |
| Air Quality-4b: Criteria pollutant and GHG emissions causing operation-related impacts to air quality and climate change (Monitored Natural Attenuation technology) | Negligible, negative, regional, long term<br>○ | No impact<br>▽ | Air Quality BMP-1<br>Air Quality MM-1<br>Air Quality MM-2<br>Air Quality MM-3 | BMP-1: No change to impacts but maintain fugitive dust emissions below the General Conformity *de minimis* threshold values [b]<br>MM-1, MM-2, and MM-3: Impacts would remain negligible.<br>○ |
| Air Quality-5: VOC emissions causing operation-related impacts to air quality and climate change | Negligible, negative, local, short term<br>○ | No impact<br>▽ | None | N/A |

TABLE 4.7-9

**Summary of Air Quality and Greenhouse Gas Emissions Impacts, Best Management Practices, and Mitigation Measures**

*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Impacts [a] | Project Alternatives [a] | | Best Management Practices and Mitigation Measures[a] | Impact After Best Management Practices and Mitigation Measures Implementation[a] |
|---|---|---|---|---|
| | Proposed Action | No Action | | |
| **Overall Alternative Impact** | Moderate, negative, regional, short term<br>◉ | Negligible, negative, regional, and short term<br>○ | Air Quality BMP-1<br>Air Quality MM-1<br>Air Quality MM-2<br>Air Quality MM-3 | BMP-1: No change to impacts but maintain fugitive dust emissions below the General Conformity *de minimis* threshold values [b]<br>Moderate, varied change to impacts·<br>◉ |

Notes:

● or ■ = Significant
◉ or ◘ = Moderate
O or ◘ = Minor
○ or □ = Negligible
▽ = No impact

Circular symbols represent negative impacts while square symbols represent beneficial impacts, and the degree to which the symbol is filled represents the severity of the impact.

BMP = best management practice
MM = mitigation measure

[a] Potential impacts, BMPs, and mitigation measures are discussed further in Sections 4.7.1 through 4.7.3.
[b] Standard BMPs are prescribed to offset fugitive dust emissions by VCAPCD Rule 55 and currently implemented under NASA's ongoing ISRA program.

# 4.8 Environmental Justice

This subsection describes the potential impacts on minority and low-income populations and children within the ROI, which is defined as the 49 census block groups (depicted on Figure 3.12-2) that are either:

- Adjacent to the SSFL property and potentially could be affected by remedial activities associated with implementation of the Proposed Action or the No Action Alternative; or
- Adjacent to or near (within approximately 1 mile of) the local roadway network used by trucks accessing SSFL during implementation of the Proposed Action.

Geographically, most of the ROI encompasses the roadways designated as haul routes and the adjacent sidewalks, service roads, and crosswalks that pedestrians (especially children) might access. The ROI includes residential areas adjacent to local access routes to and from the project site. For heavy vehicles, these routes include portions of Woolsey Canyon Road, Valley Circle Boulevard, Roscoe Boulevard, Topanga Canyon Boulevard (SR 27), Plummer Street, Box Canyon Road, Black Canyon Road, and Santa Susana Pass Road.

Section 4.8.1 includes a summary of the impact analysis to the site environmental justice under the various soil and groundwater cleanup scenarios. Section 4.8.2 provides information about potential impacts and mitigation measures applicable to site environmental justice. Section 4.8.3 provides a discussion of the No Action Alternative. Section 4.8.4 includes a summary table of impacts and mitigation measures identified in the site environmental justice analysis. Impacts and mitigation measures are numbered to correspond with the summary table to indicate where impacts might occur and how mitigation measures might offset those impacts.

The primary cause of potential impacts to the safety of children or minority and low-income populations would be the additional truck traffic, most of which would occur during the remediation phase of the Proposed Action, in particular if excavation and offsite disposal of 500,000 $yd^3$ of soil is necessary. Other soil remediation technologies would require less soil removal (320,000 $yd^3$), less truck traffic, and thus less potential impact to health and safety. Groundwater cleanup technologies would not result in additional impacts to minority and low-income populations or to children.

The impact analysis methodology for assessing potential environmental justice impacts involved comparing the percentage of minority and low-income persons in each block group adjacent to SSFL and the major access roads to the minority and poverty rates of the affected environment. The block groups were assigned a potential environmental justice impact score based on a qualitative scoring system.

The impact analysis methodology for assessing potential safety and health impacts to children consisted of documenting the total number of children residing in each block group and evaluating the potential effects on safety and health to children from exposure to additional project-related truck trips, air pollutants, and hazardous waste.

The evaluation criteria for this analysis include whether implementing the Proposed Action could disproportionately and adversely affect minority and low-income populations and whether implementing the Proposed Action could affect the safety and health of children. The following descriptions identify thresholds of impacts relevant to the environmental justice analysis:

| Impact | Description |
|---|---|
| No Impact | No impacts to minority and low-income populations or the safety of children would be expected. |
| Negligible | Disproportionate impacts to minority and low-income populations or impacts to the safety of children would not be measurable or perceptible. |
| Minor | Disproportionate impacts to minority and low-income populations or impacts to the safety of children would be small and localized. |
| Moderate | Disproportionate impacts to minority and low-income populations or impacts to the safety of children would be measurable and consequential. |

| Impact | Description |
|---|---|
| Significant | Disproportionate impacts to minority and low-income populations or impacts to the safety of children would be measurable and severe. |
| Quality: | Beneficial–would have a positive effect on the physical, social, or cultural environment.<br>Negative–would have an adverse effect on the physical, social, or cultural environment. |
| Proximity: | Local–would occur within or adjacent to the NASA-administered property at SSFL, or along roads accessing the NASA-administered property at SSFL.<br>Regional–would occur outside the NASA-administered property at SSFL or more than one mile from roads accessing the NASA-administered property at SSFL. |
| Duration: | Short term–would occur only during the proposed demolition and immediate remediation period.<br>Long term–would continue beyond the proposed demolition and immediate remediation period. |

**Environmental Justice**. The percentage of minority and low-income persons in each block group adjacent to SSFL and the major access roads was compared to the minority and poverty rates of the affected environment. Block groups are subsets of census tracts, which are small, relatively permanent statistical subdivisions of a county. U.S. Census and Los Angeles County Office of Education, and City of Los Angeles Department of Transportation data were used to assess the potential existing health and safety risks to children.

Table 3.12-1 and Figure 3.12-2 present the findings regarding minority populations and low-income populations living in the ROI. Of the 49 block groups evaluated, 18 Los Angeles County block groups (37 percent of the block groups evaluated) have at least 50 percent minority populations; nine of those block groups (18 percent) have minority population that is meaningfully greater than the general population of the ROI. Six block groups (12 percent) also were defined as low-income populations.

Five block groups in Ventura County are adjacent to SSFL. None of these block groups meet the criteria for minority or low-income populations. Therefore, there is little or no potential for *disproportionate* impacts to minority and low-income populations living in proximity to SSFL.

The Summit and Mountain View mobile home communities along Woolsey Canyon Road were specifically analyzed, as requested by local community members. These communities are located in Census tract 1132.35–Block Group 1 in Ventura County, which is near SSFL and adjacent to Woolsey Canyon Road, one of the affected local roadways. This block group is 17 percent minority, which is below the average for the ROI and the county, and has a 0 percent poverty rate. The census block group is home to 292 children.

As Figure 3.12-2 shows, there are a number of block groups defined as minority and low-income populations lying along the local roadway network used by trucks accessing SSFL, as well as many block groups that are not so defined. The southbound route along Topanga Canyon, from Roscoe Boulevard toward U.S. 101 (Ventura Freeway), goes through more minority and low-income residential areas than the northbound route along Topanga Canyon, from Roscoe Boulevard toward SR 118 (Ronald Reagan Freeway). The other roads in the local network mostly go through residential areas that are not defined as minority or low-income populations.

Table 4.8-1 further characterizes the block groups along the local roadway network. Overall, 33 block groups in the ROI are adjacent to the truck routes and 13 block groups are near (not adjacent to but within 1 mile of) the truck routes. The block groups were assigned a potential environmental justice impact score, based on the following qualitative scoring system:

- Block groups adjacent to truck routes: proximity score of 2
- Block groups near truck routes: proximity score of 1
- Block groups that do not meet the criteria for minority or low-income population: environmental justice score of 0

- Block groups with >50 percent minority population (similar to the average for the ROI and within the margin of error for ACS estimates): environmental justice score of 1
- Block groups with 20 percent or higher poverty rate: environmental justice score of 1
- Block groups with minority population meaningfully greater than the general population: environmental justice score of 2
- Block groups with 40 percent or higher poverty rate: environmental justice score of 2

TABLE 4.8-1
**Demographic and Proximity Factors for Potential Environmental Justice Impacts**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Description of Block Groups | Potential Impact Score | Block Groups | |
|---|---|---|---|
| | | Number | Percent |
| Near or adjacent to truck routes, does not meet criteria for minority or low-income population | Potential Impact = 0 | 31 | 63 |
| Within 1 mile of truck routes with >50% minority population | Potential Impact = 1 | 5 | 10 |
| Adjacent to truck routes with > 50% minority population, OR<br>Within 1 mile of truck routes with meaningfully greater minority population | Potential Impact = 2 | 4 | 8 |
| Within 1 mile of truck routes with meaningfully greater minority population and >= 20% poverty rate | Potential Impact = 3 | 1 | 2 |
| Adjacent to truck routes with meaningfully greater minority population, OR<br>Adjacent to truck routes with > 50% minority population and >= 20% poverty rate | Potential Impact = 4 | 4 | 8 |
| Adjacent to truck routes with meaningfully greater minority population and >= 20% poverty rate | Potential Impact = 6 | 3 | 6 |
| Adjacent to truck routes with meaningfully greater minority population and >= 40% poverty rate | Potential Impact = 8 | 1 | 2 |

Environmental justice scores were added (for block groups with more than one of those indicators) and were then multiplied by the proximity score to get the potential impact score. Thus, a block group adjacent to or near a truck route that does not meet the criteria for minority or low-income population would have a potential impact score of 0. A block group adjacent to a truck route (proximity 2) with meaningfully greater minority population and a 40 percent or higher poverty rate (environmental justice 4) would have a potential impact score of 8.

Overall, only 18 percent of the block groups in the ROI have a potential impact score of 3 or more, with demographic indicators above the general population of the ROI and located adjacent to truck routes. Therefore, there is little potential for *disproportionately* high and adverse environmental justice effects related to increased truck traffic.

The types and magnitude of potential environmental and associated human health and safety effects are described in Sections 4.8.1.1 and 4.8.1.2.

**Protection of Children**. NASA completed a qualitative evaluation of the potential effects on safety and health impacts to children from exposure to additional project-related truck trips (most of which would occur during the remediation phase), air pollutants, and hazardous waste. The evaluation in Sections 4.8.2 and 4.8.3 is a summary, based on detailed analysis provided in other sections as referenced below.

Table 3.12-2 provides the total number of children residing in each census block group. Table 4.8-2 lists the public schools that are located near local roadways affected by the proposed action, where children would be walking or biking to and from schools or school bus stops. This evaluation also includes students under age 18 who drive or are driven to and from schools.

TABLE 4.8-2
**Schools Near Local Roadways Affected by the Proposed Action**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Community | School Name | Address | Approximate Distance from Roadway[a] |
|---|---|---|---|
| Canoga Park | Our Lady of the Valley School | 22021 Gault Street | 0 mile, at intersection of Topanga Canyon Boulevard and Gault Street |
| Canoga Park | Canoga Park Elementary School | 7438 Topanga Canyon Boulevard | 0 mile, intersection of Topanga Canyon Boulevard and Runnymede |
| Canoga Park | Nevada Avenue Elementary School | 22120 Chase Street | 0.1 mile from Topanga Canyon Boulevard |
| Canoga Park | Christopher Columbus Middle School | 22250 Elkwood Street | 0.3 mile from Topanga Canyon Boulevard |
| Canoga Park | Ingenium Charter Schools | 22250 Elkwood Street | 0.3 mile from Topanga Canyon Boulevard |
| Canoga Park | Pomelo Drive Elementary School | 7633 March Avenue | 0.7 mile from Roscoe Boulevard |
| Canoga Park | Hart Street Elementary School | 21040 Hart Street | 0.9 mile from Topanga Canyon Boulevard |
| Canoga Park | Limerick Avenue Elementary School | 8530 Limerick Avenue | 1.7 miles from intersection of Roscoe Boulevard and Topanga Canyon Boulevard |
| Canoga Park | Canoga Park High School | 6850 Topanga Canyon Boulevard | 0 mile, intersection of Topanga Canyon Boulevard and Vanowen Street |
| Canoga Park | Faith Baptist School | 7644 Farralone Avenue | 0.3 mile from Topanga Canyon Boulevard |
| Chatsworth | Chatsworth Park Elementary School | 22005 Devonshire Street | 0 mile, intersection of Topanga Canyon Boulevard and Devonshire Street |
| Chatsworth | Lawrence Middle School | 10100 Variel Avenue | 1 mile from Topanga Canyon Boulevard |
| Chatsworth | Germain Street Elementary School | 20730 Germain Street | 1.4 mile from Topanga Canyon Boulevard |
| Chatsworth | Chatsworth High School | 10027 Lurline Avenue | 1.5 miles from Topanga Canyon Boulevard |
| Chatsworth | Superior Street Elementary | 9756 Oso Avenue | 0.3 mile from intersection of Oso Avenue and Plummer Street |
| Chatsworth | W.T. Aggeler Opportunity High School | 21050 Plummer Street | 1.8 miles (indirect walking distance) from Topanga Canyon Boulevard |
| Chatsworth | Chaminade College Preparatory Middle School | 19800 Devonshire Street | 2.4 miles from Topanga Canyon Boulevard |
| Simi Valley | Knolls Elementary School | 6334 Katherine Street | 1.7 miles from Box Canyon Road and Santa Susana Pass Road |
| West Hills | Capistrano Elementary School | 8118 Capistrano Avenue | 0.3 mile from Roscoe Boulevard |
| West Hills | Justice Street Elementary School | 23350 Justice Street | 0.3 mile from Roscoe Boulevard between Valley Circle and Topanga Canyon Boulevards |

TABLE 4.8-2
**Schools Near Local Roadways Affected by the Proposed Action**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Community | School Name | Address | Approximate Distance from Roadway[a] |
|---|---|---|---|
| West Hills | New Community Jewish High School | 22622 Vanowen Street | 0.8 mile fromTopanga Canyon Boulevard |
| West Hills | Park Hill School | 7401 Shoup Avenue | 0.5 mile from the intersection of Valerio Street and Topanga Canyon Boulevard |
| West Hills | Kadima Day School | 7011 Shoup Avenue | 0.8 mile from Topanga Canyon Boulevard |
| West Hills | West Valley Christian | 22450 Sherman Way | 0.6 mile from Topanga Canyon Boulevard |
| West Hills | Hamlin Street Elementary School | 22627 Hamlin Street | 1 mile from Topanga Canyon Boulevard |
| West Hills | Chaminade College Preparatory High School | 7500 Chaminade Avenue | 1.2 miles from Valley Circle Boulevard or Roscoe Boulevard |
| Woodland Hills | El Camino Real High School | 5440 Valley Circle Boulevard | 2.5 miles from Topanga Canyon Boulevard |
| Woodland Hills | Woodland Hills Private School | 22555 Oxnard Street and 22322 Collins St | 0.7 mile and 0.5 mile from Topanga Canyon Boulevard |
| Woodland Hills | Woodland Hills Academy | 20800 Burbank Boulevard | 1.2 miles from Topanga Canyon Boulevard and Burbank Boulevard |
| Woodland Hills | Calabash Street Elementary | 23055 Eugene Street | 1.7 miles from Topanga Canyon Boulevard |
| Woodland Hills | Woodland Hills Elementary | 2201 San Miguel Street | 0.2 mile from Topanga Canyon Boulevard |
| Woodland Hills | Woodlake Elementary | 23231 Hatteras Street | 1.8 miles from Topanga Canyon Boulevard |

[a] Shading indicates the schools located on or very close to the roadways

### 4.8.1 Proposed Action–Demolition, Soil Cleanup to Background Levels, and Groundwater Cleanup

The following subsections address the potential impacts to low-income and minority populations and children from implementation of the Proposed Action.

#### 4.8.1.1 Demolition

***No disproportionately high and adverse impacts*** to minority populations or low-income populations would be expected from the proposed demolition activities ***(EJ Impact-1)***. As previously discussed, only 18 percent of the block groups in the ROI have a potential environmental justice impact score of three or more (Table 4.8-1), because they are located adjacent to truck routes and with demographic indicators above the general population of the ROI.

The potential effects on the safety of children from traffic and air pollutants, as discussed in this section, could also affect adults. However, these impacts would not be disproportionately experienced by members of minority or low-income populations, as compared to the general population of the ROI. As listed in Table 4.8-1, only 18 percent of the block groups in the ROI have a potential impact score of three or more, based on the combination of proximity to truck routes and demographic profile.

**Offsite Transportation of Hazardous and Nonhazardous Materials**

Potential moderate impacts to the safety of children could be anticipated from an increase in truck traffic, which would be hauling material that would include scrap metal, usable salvaged equipment, recyclable asphalts, and contaminated demolition waste from SSFL along the proposed haul routes to authorized disposal or recycle facilities. These materials would be packed in containers that prevent the release of hazardous waste or other materials.

**Exposure to Truck Traffic**

The Proposed Action assumes trucks would travel on local roadways between 7 a.m. and 7 p.m. on weekdays (no weekends or holidays). As discussed in Section 4.5, the proposed demolition activities would generate additional traffic on local roadways. An estimated 3,660 trips associated with demolition hauling would take place for approximately one year. The Proposed Action would not add new haul routes to those currently used. Children are currently exposed to large amounts of traffic on the existing roadways. Table 4.8-2 lists the schools that are within the ROI, within 1.5 miles of the local roadways where children might be exposed to additional project-related truck or work crew traffic. Figure 3.12-3 shows the locations of those schools.

Children would experience an increased exposure to traffic as they crossed streets while walking to and from schools or school bus stops, for the duration of the Proposed Action. The detailed traffic analysis presented in Section 4.5 (Table 4.5-4) estimates potential exposure of school children to truck traffic, based on additional factors including school attendance boundaries, recommended walking routes to school, school hours, and the number of students enrolled.

The truck traffic exposure risk for children is presented in Table 4.5-4 (Traffic and Transportation). During the peak hours of travel to and from school, an estimated 20 students per hour could be exposed to truck traffic while walking or bicycling, for a total of 4,374 walking/bicycling trips throughout the demolition phase of the project. (Additional and higher exposure would occur during car trips.) Up to 32,270 total student trips could be exposed to the project-related truck traffic during the anticipated 12- to 18-month demolition period (Table 4.5-4), of which an estimated 5,976 student exposures would occur while walking or bicycling. Part of the truck route is on a steep, windy road with some blind curves, which would require special care to avoid accidents. Section 4.5 contains detailed information about truck traffic and safety.

Overall, ***moderate, negative, local,*** and ***short term*** impacts to the safety of children would be expected because of the increased exposure to truck traffic during the demolition phase *(**EJ Impact-2**)*. These terms used to describe potential impacts are standard terms used throughout this EIS for consistency. NASA wishes to underscore, however, that the agency cares about the safety of children, and even one injured child is unacceptable and significant***. All possible truck safety precautions would be taken throughout the duration of the project.***

**Exposure to Air Pollutants**

As discussed in Section 4.7, children living near and attending schools near the truck routes could also be exposed to increased air pollutants generated by truck exhaust, including diesel particulate matter (DPM).

Demolition activities on the SSFL property are not expected to result in fugitive dust emissions that would impact air quality with additional exposure for children. Prevailing winds are generally from the southwest. Although fugitive dust is expected to be dispersed some distance by winds, the exact distance cannot be predicted without performing air dispersion modeling. However, fugitive dust particles tend to be large and are expected to settle out of the air before they are dispersed significant distances. Therefore, fugitive dust emissions from demolition activities generally are expected to be contained within or near the SSFL property boundary, even when considering potential dispersion by winds in the vicinity of SSFL. Because impacts from exposure to air pollutants are minor, health impacts related to exposure also are minor. Section 4.7 contains additional information regarding air quality.

### 4.8.1.2 Soil Cleanup to Background

***No disproportionate impacts*** would be expected to minority or low-income populations from the proposed environmental cleanup activities *(**EJ Impact-1**)*. The potential effects on the safety of children from traffic and air pollutants, as discussed in this section, could also affect adults. However, these impacts would not be disproportionately experienced by members of minority or low-income populations, as compared to the general population of the ROI. As listed in Table 4.8-1, only 18 percent of the block groups in the ROI have a potential environmental justice impact score of 3 or more, based on the combination of proximity to truck routes and demographic profile.

**Soil Remediation**

As detailed in Section 4.9, successful implementation of soil remediation would result in a ***minor, beneficial, local***, and ***long-term*** impact from hazardous and nonhazardous wastes, protecting the health of children and adults living near SSFL in the future. During remediation activities, proper management of wastes and monitoring would avoid new contamination migration or exposure pathways.

**Excavation and Offsite Disposal**

***Offsite Transportation of Hazardous and Nonhazardous Materials***

Potential moderate impacts to the safety of children could be anticipated from an increase in truck traffic, which would be hauling contaminated excavated soil from SSFL along the proposed haul routes to authorized disposal facilities. The soil would be packed in containers that prevent the release of hazardous waste or other materials.

***Exposure to Truck Traffic***

The risk for children from exposure to truck traffic is presented in Table 4.5-4. The greatest potential exposure of children to additional truck traffic would occur during the remediation phase of the Proposed Action under the excavation and offsite transportation option. Other soil remediation technologies would require less soil removal (320,000 $yd^3$), less truck traffic, and thus less impact to the safety of children.

If excavation and offsite disposal of 500,000 $yd^3$of contaminated soil were necessary, an estimated 73 students per hour could be exposed to truck traffic, while walking or bicycling during the peak hours of travel to and from school. Up to 364,291 total student trips could be exposed to the project-related truck traffic during the anticipated 2 years (500 days) of excavation and disposal activities (Table 4.5-4), of which an estimated 75,060 student exposures would occur while walking or bicycling.

If onsite soil remediation technologies require less contaminated soil to be removed (320,000 $yd^3$) and thus less truck traffic, an estimated 43 students per hour could be exposed to truck traffic, while walking or bicycling during the peak hours of travel to and from school. Up to 210,268 total student trips could be exposed to the project-related truck traffic during the excavation and offsite disposal phase of the project (Table 4.5-4), of which an estimated 43,034 student exposures would occur while walking or bicycling.

Part of the truck route is on a steep, windy road with some blind curves, which would require special care to avoid accidents. Section 4.5 provides detailed information about truck traffic and safety.

The Proposed Action would not add new haul routes to those currently used. Children currently are exposed to large amounts of traffic on the existing roadways. A ***moderate, negative, local***, and ***short-term*** impact on safety of children *(**EJ Impact-2**)* would occur. As previously stated, however, even one injured child is unacceptable and significant to NASA. **All possible truck safety precautions would be taken throughout the duration of the project.**

***Exposure to Air Pollutants***

As discussed in Section 4.7, children living near and attending schools near the truck routes could be exposed to increased air pollutants generated by truck exhaust associated with remedial activities, including DPM. Increased exposure of children to truck traffic is necessary to perform the excavation and offsite disposal of 500,000 $yd^3$of contaminated soil. Other soil remediation technologies would result in less truck traffic and thus less impact to the safety of children. Fugitive dust emissions from excavation activities generally would be expected to be contained within or near the SSFL property boundary, even when considering potential dispersion by winds in the vicinity of SSFL.

Because impacts from exposure to air pollutants would be minor, health impacts related to exposure also would be minor. Regardless of the potential for dispersion of fugitive dust, implementation of the Proposed Action with the lower soil removal (320,000 $yd^3$) estimate would result in approximately 19 percent fewer fugitive dust emissions during onsite excavation activities than implementation of the Proposed Action with the high soil removal estimate (500,000 $yd^3$).

***Minor, negative, local,*** and ***short-term*** impacts would be expected ***(EJ Impact-3)***. Section 4.7 contains additional information regarding air quality.

**Excavation and Offsite Disposal with Ex Situ Onsite Treatment**

Increased exposure of children to truck traffic would be necessary to perform the excavation and offsite disposal of 500,000 $yd^3$ of soil. Other soil remediation technologies could reduce the volume of excavated soil (320,000 $yd^3$ estimated), as discussed above, resulting in less truck traffic and thus less impact to the safety of children.

The specific ex situ cleanup technologies being considered for use on SSFL would not result in additional adverse impacts to minority and low-income populations or to the safety of children living near SSFL or along the truck routes.

**Excavation and Offsite Disposal with In Situ Onsite Treatments**

Increased exposure of children to truck traffic would be necessary to perform the excavation and offsite disposal of 500,000 $yd^3$of soil. Other soil remediation technologies could reduce the volume of excavated soil (320,000 $yd^3$ estimated), as discussed previously, resulting in less truck traffic and thus less impact to the safety of children.

The specific in situ cleanup technologies being considered for use on SSFL would not result in additional adverse impacts to minority and low-income populations or to the safety of children living near SSFL or along the truck routes.

#### 4.8.1.3 Groundwater Cleanup

As detailed in Section 4.6, successful implementation of groundwater remediation technologies would result in a ***moderate, beneficial, local,*** and ***long-term*** impact from volatile organic compounds, protecting the health of children and adults living near SSFL in the future.

The specific groundwater cleanup technologies being considered would not result in additional adverse impacts to minority and low-income populations or to the safety of children living near NASA or along the truck routes.

### 4.8.2 Mitigation Measures

This subsection provides a brief description of impacts previously discussed in detail, along with corresponding mitigation measures. Mitigation is an action that would benefit the environment, but must be agreed to by agency stakeholders and NASA. Agreed upon mitigation measures would be provided in the ROD. These impacts and mitigation measures are numbered to correspond to the impact summary table provided in Section 4.8.4.

No mitigation would be necessary under the Proposed Action to reduce the effects on minority and low-income populations. Adherence to the updated CTCP, which includes a truck safety plan, per ***Traffic Mitigation Measure-1***, would help protect the safety of children. Restricting weekday truck travel during the morning and afternoon travel times for students would reduce exposure of schoolchildren to the project-related truck trips, but would extend the duration of cleanup activities beyond the limits set in the 2010 AOC.

### 4.8.3 No Action Alternative

Under the No Action Alternative, there would be no disproportionate impacts to minority or low-income populations. Minimal offsite truck use associated with ongoing SSFL activities, as well as vehicle use along local roadways not associated with SSFL operations would continue, with minimal potential for safety or health risks to children. The impact to the safety of children under the No Action Alternative would be considered ***negligible, negative, local,*** and ***short term (EJ Impacts-2 and 3)***.

### 4.8.4 Summary of Impacts and Mitigation Measures

Table 4.8-3 provides a summary of the impacts on environmental justice, as described in this section. Impact and mitigation numbering corresponds to Table 4.8-3. The specific mitigation and corresponding impact are provided, followed by a resulting impact level if mitigation is applied successfully. Table 4.8-3 concludes with an overall alternative impact level, based on the highest level of impact identified in the analysis.

TABLE 4.8-3
**Summary of Environmental Justice Impacts and Mitigation Measures**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Impacts[a] | Project Alternatives[a] | | Mitigation Measures[a] | Impact After Mitigation Measures Implementation[a] |
|---|---|---|---|---|
| | **Proposed Action** | **No Action** | | |
| EJ-1: Low-Income and Minority Populations | No impact ▽ | No impact ▽ | None | N/A |
| EJ-2: Potential safety risk due to increased truck traffic (child safety) | Moderate, negative, local, short term ⦿ | Negligible, negative, local, short term ○ | Traffic MM-1 | Moderate, negative, local, short term ⦿ |
| EJ-3: Potential health risk due to increased truck emissions (child safety) | Minor, negative, local, short term **O** | Negligible, negative, local, short term ○ | None | N/A |
| **Overall Alternative Impact** | Moderate, negative, local, short term ⦿ | Negligible, negative, local, short term ○ | Traffic MM-1 | Moderate, negative, local, short term ⦿ |

Notes:
● or ■ = Significant
⦿ or ▣ = Moderate
**O** or ◘ = Minor
○ or □ = Negligible
▽ = No impact
Circular symbols represent negative impacts while square symbols represent beneficial impacts, and the degree to which the symbol is filled represents the severity of the impact.

MM = mitigation measure

[a] Potential impacts and mitigation measures are discussed further in Sections 4.8.1 through 4.8.3.

# 4.9 Health and Safety

This subsection provides a description of the potential health and safety hazards to onsite work crews associated with implementing the Proposed Action or the No Action Alternative within the ROI, defined as the NASA-administered property of SSFL and roadways accessing the NASA property. During the health and safety evaluation, NASA considered the potential for safety hazards associated with material exposure hazards; operational safety hazards such as utilities; and physical structural hazards such as slip, trip, and fall. Natural hazards, such as weather, geography, and biology of the site, also were considered for health and safety impacts. As discussed in Section 3.9.1, SSFL activities follow a worker Health and Safety Plan (HSP). A discussion of natural hazards is included within the following subsections, such as Operation Safety Standards.

Section 4.9.1 includes a summary of the impact analysis to the health and safety under the various soil and groundwater cleanup scenarios. Section 4.9.2 provides information about potential impacts and BMPs and mitigation measures applicable to site health and safety. Section 4.9.3 provides a discussion of the No Action Alternative. Section 4.9.4 includes a summary table of impacts and corresponding BMPs and mitigation measures identified in the site health and safety analysis. Impacts, BMPs, and mitigation measures are numbered to correspond with the summary table to indicate where impacts might occur and how BMPs and mitigation measures might offset those impacts.

Roadways near landfill locations were not considered in the detailed health and safety analysis as the project related traffic volume, once outside of the vicinity of SSFL, would dissipate in route to various disposal facilities. Health and safety related to traffic on SSFL is analyzed in Section 4.5.

The following descriptions identify thresholds of impacts relevant to the health and safety analysis:

| Impact | Description |
|---|---|
| No Impact | No potential for impact on human health and safety. |
| Negligible | There might be a slight increased risk to human health and safety, but a level that would not warrant a change to current protocol. |
| Minor | There would be an increased risk to human health and safety at a level easily offset by proper management and planning. |
| Moderate | There would be an increased risk to human health and safety that would require changes to current protocol, protection measures, or access. |
| Significant | There would be an increased risk to human health and safety that would require substantial changes to current protocol, protection measures, or access and could result in severe and long-lasting effects. |
| Quality: | Beneficial–would have a positive effect on the physical, social, or cultural environment.<br>Negative–would have an adverse effect on the physical, social, or cultural environment. |
| Proximity: | Local–would occur within the NASA-administered property at SSFL.<br>Regional–would occur outside the NASA-administered property at SSFL. |
| Duration: | Short term–would occur only during the proposed demolition and immediate remediation period.<br>Long term–would continue beyond the proposed demolition and immediate remediation period. |

## 4.9.1 Proposed Action–Demolition, Soil Cleanup to Background, Groundwater Cleanup

### 4.9.1.1 Demolition

Demolition would include removal of structures up to 5 ft below grade. Equipment such as excavators, crawler cranes, compressors, and pumps would be used during demolition. Potential health and safety hazards could result from incidents such as exposure of workers to contamination, release of contamination, accidents involving heavy equipment and debris. Potential impacts from demolition applicable to health and safety are discussed in the following text.

**Safety Hazards Associated with Material Exposure**

Health and safety factors involving safety hazards associated with material exposure might include dust generated from demolition activities, which potentially could expose workers to contaminated soil, lead-based paint, or asbestos if proper personal protection measures or BMPs (Section 4.9.2) were not followed.

The proposed environmental cleanup activities would reduce exposure potential in the long term. Hazardous concentrations in the soils beneath buildings after demolition would be reduced to Look-Up Table values, as defined by DTSC, resulting in a ***minor, beneficial, local***, and ***long-term*** impact or risk after the completion of environmental cleanup *(**Health Impact-1**)*. Because of the broad potential for injury or exposure, the health and safety impact resulting from demolition would be considered ***moderate, negative, local,*** and ***short term (Health Impact-2***).

With the exception of the MNA remediation technology, the proposed remediation technologies for soil and groundwater require considerable ground disturbance with the installation of a network of wells or boreholes, extraction of vapors and soils, or the excavation of contaminated surface and subsurface soil, which would have the most impacts. Such ground disturbance activities could generate dust and expose workers to contaminants in the soil. Routes of exposure could include inhalation, ingestion, or dermal contact. Activities resulting in dust generation could include drilling, grading, and excavation activities; transfer of soil cuttings to containers; transporting materials offsite; and vehicle traffic on unpaved roads. The potential for exposure to contaminated airborne soil would be considered potentially ***moderate, negative, local,*** *and* ***short term (Health Impact-2***).

**Operational Safety Hazards**

Potential health and safety factors involving the demolition of existing structures on the NASA-administered portion of SSFL might include being struck by heavy equipment or debris from demolition activities; fall and tripping hazards; and biological and wildlife hazards such as poison oak, stinging insects, and rattlesnakes. The potential for exposure to operational safety hazards would be considered potentially ***moderate, negative, local,*** and ***short term (Health Impact-2).***

**Structural Hazards**

Containers or tanks potentially could be encountered during demolition activities, resulting in the accidental release of contaminants such as lead-based paint (from building surfaces, steel, window surfaces, and chalking), asbestos-containing material, heavy metals, petroleum products, or PCBs from transformers. In addition, after removal of the building foundations, there would be a potential to encounter unknown pre-existing soil contamination from accidental spills or releases of hazardous materials from chemical storage areas, floor drains, sumps, trenches, and similar features within or around the structures.

Materials proposed for demolition and removal would be characterized in situ before demolition to assist in efforts to segregate nonhazardous from hazardous or incompatible wastes during demolition, or would be characterized before being loaded onto trucks or trailers for transport to an approved offsite construction waste facility. Dismantled components would be contained, as appropriate, and transported for offsite disposal.

Because of the broad potential for injury or exposure, the impact from demolition activities on health and safety is considered ***moderate, negative, local,*** *and* ***short term (Health Impact-2***).

### 4.9.1.2 Soil Cleanup to Background

Impacts to health and safety associated with remediation activities (soil and groundwater) generally would include potential accidental release of contaminants, encountering unknown pre-existing contamination, traffic concerns such as workers accessing the site (Section 4.5), exposure of employees to contaminated soil, and primary construction health and safety concerns with the use of heavy equipment such as backhoes, bulldozers, loaders, dump trucks, and paving equipment.

### Excavation and Offsite Disposal

Excavation and offsite disposal of surface and subsurface contaminated soil would include the use of heavy equipment and transport to an approved offsite facility. Safety hazards associated with operating large equipment such as backhoes, front end loaders, and dump trucks would apply. Also, with the large number of trucks used to haul the soil, the traffic volume on the narrow, curvy roads at SSFL could pose a driving hazard. In addition, there are railroad crossings along some of the transportation routes that could potentially pose a driving hazard.

The proposed remediation technologies for soil would require excavation, ground disturbance, and offsite disposal of surface and subsurface soil. There are two possible scenarios for excavation. One would result in the removal of approximately 500,000 $yd^3$ contaminated soil. The other would result in excavation and offsite disposal of approximately 320,000 $yd^3$ of untreatable soil, followed by in situ or ex situ treatment of remaining soil. Possible impacts of both scenarios are discussed in the following text.

Excavation, ground disturbance, and offsite disposal of 500,000 $yd^3$ of soil could generate dust and expose workers to contaminants in the soil. Routes of exposure could include inhalation, ingestion, or dermal contact. Activities resulting in dust generation could include grading and excavation activities; transfer of soil to trucks; transporting materials offsite; and vehicle traffic on unpaved roads. The potential for exposure to contaminated airborne soil would be considered potentially ***moderate, negative, local,*** and ***short term (Health Impact-2)***.

Successful implementation of a soil remediation technology in addition to Excavate and Offsite Disposal would reduce the volume of contaminated soil requiring offsite disposal to 320,000 $yd^3$. However, ground disturbance activities could still generate dust and expose workers to contaminants in the soil. Similar to the above, routes of exposure could include inhalation, ingestion, or dermal contact. Activities resulting in dust generation could include grading, and excavation activities; transfer of soil to trucks; transporting materials offsite; and vehicle traffic on unpaved roads. The potential for exposure to contaminated airborne soil would be considered potentially ***moderate, negative, local,*** *and* ***short term (Health Impact-2)***.

### Excavation and Offsite Disposal with Ex Situ Onsite Treatment

Ex situ treatment of the soil would entail the use of heavy equipment (such as a backhoe, front end loader, or dump truck) to remove the soil and transport it to a treatment area. Operational hazards associated with operating large equipment would be present during the implementation of ex situ technologies.

Soil washing is one remedial technology that could be applied to the soil and would possibly result in exposure to contaminated fine-grained soil and the wastewater stream. Land farming could entail the exposure to dust while aerating the soil on a periodic basis and adding moisture and nutrients. Thermal desorption potentially could include extreme heat exposure and as well as exposure to the resulting air stream that would contain the contamination volatilized from the soil. Chemical oxidation could result in worker exposure to oxidants while mixing them with the soil for treatment. The potential for exposure to contaminated airborne soil, chemical oxidants, and hazards associated with operating large equipment with excavation and transport to a treatment area onsite would be considered potentially ***moderate, negative, local***, and ***short term*** (***Health Impact-2).*** The aggregate impact of excavation and offsite disposal of 320,000 $yd^3$ of soil and ex situ treatment would be considered potentially ***moderate, negative, local***, and ***short term (Health Impact-2).***

### Excavation and Offsite Disposal with In Situ Onsite Treatment

In situ treatment of the soil would entail the use of heavy equipment, primarily a drilling rig to install boreholes and wells. In addition, either a high-pressure injection apparatus or pumps would be used to apply fluids or air to the subsurface. Operational hazards associated with operating large equipment and possibly high pressure injections systems would be present during the implementation of in situ technologies.

SVE would entail connecting a blower to the extraction wells and applying a vacuum to extract the contaminated soil vapor from the soil that could pose an exposure hazard to workers. In situ anaerobic or aerobic treatments entail injecting oxygen releasing compounds, air, or electron donors into the subsurface. These fluids or air generally are easy to handle and would not pose a health and safety risk. In situ chemical oxidation would entail injecting oxidants into the subsurface. The storage and handling of oxidants could pose a hazard to onsite workers. The potential for exposure to chemical oxidants and hazards associated with operating large equipment with excavation within the area of concern would be considered potentially ***moderate, negative, local,*** and ***short term (Health Impact-2).*** The aggregate impact of excavation and offsite disposal of 320,000 $yd^3$ of soil and in situ treatment would be considered potentially ***moderate, negative, local,*** and ***short term (Health Impact-2).***

#### 4.9.1.3 Groundwater Cleanup

Impacts to health and safety associated with groundwater remediation activities generally would include potential accidental release of contaminants, encountering unknown pre-existing contamination, traffic concerns such as workers accessing the site, primary construction health and safety concerns with the use of heavy equipment, and general health and safety concerns with the operations and maintenance of groundwater treatment systems.

Groundwater remedial pump-and-treat potentially could include the accidental release of contaminants if equipment were to not operate properly or there were leaks in the piping system. Vacuum extraction would entail connecting a blower to the extraction wells and applying a vacuum to extract the contaminated vapor from the rock matrix that could pose an exposure hazard to workers. The in situ technologies that entail injecting oxidants in the groundwater to destroy contamination could be hazardous to workers who store and handle the oxidants. MNA would entail sampling groundwater on a periodic basis that potentially would include worker exposure to contaminants in the groundwater. The potential for exposure to chemical oxidants and hazards associated with operating large equipment would be considered potentially ***moderate, negative, local,*** and ***short term (Health Impact-2).***

### 4.9.2 Best Management Practices

This subsection provides a brief description of impacts previously discussed in detail, along with corresponding BMPs. BMPs are defined as actions required by law or an industry standard included in the Proposed Action activities. These impacts and BMPs are numbered to correspond to the impact summary table provided in Section 4.9.4.

***Health BMP-1*****:** An HSP would be developed for the proposed activities and implemented prior to the Proposed Action and would include the following:

- General hazard controls
- Monitoring requirements
- Project-specific hazard controls such as asbestos, lead-based paint, and earthmoving equipment
- Traffic control
- Physical hazard controls such as noise and temperature extremes
- Biological hazard controls

Designated areas for chemical storage and handling would be identified. The plan would be reviewed for the project activities and include procedures to mitigate potential hazards, measures that provide protection from physical hazards, measures that provide protection from chemical hazards that might be present at the site, decontamination procedures, and worker and health and safety monitoring criteria to be implemented during project activities, if needed. Per 29 CFR Part 1910, Hazardous Waste Operations and Emergency Response Standard (HAZWOPER), safety training for site workers must be met in order to conduct cleanups or emergency response operations. In addition, associated worker safety training would occur before ground disturbing activities began. Work zones would be marked clearly with barricades or construction fencing to control unauthorized access to the areas. In addition, if dust or chemical monitoring is required during demolition or during soil and groundwater remediation activities, it would be implemented according to the site-specific HSP, which would list the proper action limits at which controls would be required ***(Health Impact-2).***

***Health BMP-2:*** As a BMP, a standard operating procedure document (*The Standard Operating Procedures: Building Demolition Debris Characterization and Management for Santa Susana Field Laboratory* [NASA, 2011b]) would be updated to include dust suppression measures (water misting and spraying devices during demolition and soil moving activities to minimize dust emissions) and site preparation activities (a secure demolition permit and established demolition work zones with controlled access). This BMP entails establishing dust monitors around the work site to monitor the amount of airborne dust. The air monitors could be equipped to record dust levels on a specified interval and have an alarm that will notify workers if dust levels reach a specified level. These measures also would be captured in the project Dust Control Plan (***Air Quality Mitigation Measure-3***). Additionally, if a tank containing contaminants of concern (COCs) or chemicals were discovered during demolition, the contents would be sampled, removed, and properly disposed. Tanks of unknown application and/or identification status were included in the Sitewide Inventory (NASA, 2012a). Personnel involved in the demolition activities would follow the requirements in the site-specific HSP before onsite activities start *(**Health Impact-2**).*

***Health BMP-3:*** As a BMP, a Hazardous Substance Control and Emergency Response Plan would be prepared to include project-specific hazard controls for dust, lead-based paint, asbestos, heavy metals, pesticides, petroleum products, PCBs from transformers, other COCs, and spill containment procedures in the unlikely event that chemicals should be found during pre-demolition. Required personal protective equipment and worker training and qualification would be included in the site-specific HSP. With the implementation of these mitigation measures (HSPs, Hazardous Substance Control and Emergency Response Plans, dust control measures, proper removal and disposal of COCs, and standard operating procedures [*The Standard Operating Procedures: Building Demolition Debris Characterization and Management for Santa Susana Field Laboratory* [NASA, 2011]), the Proposed Action would result in an impact deemed ***moderate**, **negative, local,*** and ***short-term** (**Health Impact-2**).*

By implementing the above BMPs and mitigation measure, the potential impact to human health and safety would be ***negligible, negative, local,*** and ***long-term***.

### 4.9.3 No Action Alternative

Because no demolition or environmental cleanup would occur under the No Action Alternative, no new impacts associated with soil or groundwater contamination from accidental spills or releases of hazardous materials from structures would occur under this alternative. Likewise, potential safety hazards would not occur as a result of the various remediation technologies. However, under the No Action Alternative, the potential for exposure to contaminated soil could include inhalation, ingestion, or dermal contact. The buildings and structures currently onsite would remain, and potential loss of structural integrity associated with facility abandonment and lack of maintenance would increase both the potential for hazardous materials to be released into the soils and the health and safety concerns for employees. Deterioration of the buildings and structures over time could cause potential exposure to contaminants and hazards associated with the existing buildings and structures, including subsurface structures. These impacts can be direct or can be caused as a result of diminished structural integrity. Implementation of the protection measures or limiting access to the buildings and structures would be required to reduce risk to human health and safety. The impact of these measures would be considered ***moderate, negative, local***, and ***long term** (**Health Impact-2**).*

The GETS and ISRA programs would be focused on specific areas of groundwater and surficial soil contamination and, therefore, broader pockets of contamination would remain. MNA could take hundreds of years and lengthen the risk of harmful exposure. This impact would be considered ***moderate, negative, local,*** and ***long term** (**Health Impacts-1, 2**).*

As listed in Table 3.9-1, each of the risk-based cleanup scenaros indicates that some actions are required to be protective of human health. In terms of impacts from taking no action, they would vary depending on the cleanup scearo. Assuming no cleanup actions, no institutional control to minimize exposures, and based on the anticipated future use of open or park space, the no action alternative results in ***moderate, negative, local,*** and ***long–term impacts*** (***Health Impact-1***).

A White Paper completed in February 2014 (http://ssfl.msfc.nasa.gov/documents/eis/SSFL-Comparative-Cleanup-Evaluation.pdf). evaluated the differences in general cleanup requirements between a background cleanup scenario versus a risk-based cleanup scenario typically conducted under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process using the guidelines in the SRAM. The White Paper summarized the results of human health and ecological risk evaluations that compare the differences in general cleanup requirements between a background cleanup scenario (based on Look-Up Table values [DTSC, 2013] as the cleanup levels) and a risk-based cleanup scenario comparative analysis.

The paper providesan evaluation of 59 chemicals. These 59 chemicals were selected as requiring cleanup under the background scenario based on agreements among NASA, Boeing, and DTSC. The 59 chemicals include those detected across the Boeing or NASA properties that either exceeded background values or, for those chemicals lacking background values, were detected in soil.

On the basis of this comparative analysis, cleanup to the background scenario is more conservative than necessary to protect human health and the environment based on three factors: 1) application of background LUT values (cleanup levels) that are 1.2 to more than 1 million times more conservative than risk-based levels; 2) potentially requiring cleanup to meet the AOC of up to 51 chemicals that do not pose risk; and 3) potentially affecting up to 87 additional acres under the AOC as compared to a risk-based cleanup.

Consequently, the benefit to human health and the environment of cleaning up to background is questionable for several reasons. The more aggressive cleanup of the site that would occur under the background cleanup (more soil removal, more trucks entering the site, more emissions, more road miles, more soil to dispose of in landfills, etc.) could result in an increase in traffic accidents, spills, and habitat modification, as well as disturbance of wildlife, all of which might result in reduced net benefits when compared to the risk-based cleanup scenario.

### 4.9.4 Summary of Impacts and Best Management Practices

Table 4.9-1 summarizes the health and safety impacts and BMPs. Impact and BMP numbering correspond to Table 4.9-1. The specific BMP and corresponding impact are provided, followed by a resulting impact level if is the BMP is applied successfully. Table 4.9-1 concludes with an overall alternative impact level, based on the highest level of impact identified in the analysis.

TABLE 4.9-1
**Summary of Health and Safety Impacts and Best Management Practices**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Impacts[a] | Project Alternatives[a] | | Best Management Practices[a] | Impact After Best Management Practices Implementation[a] |
|---|---|---|---|---|
| | Proposed Action | No Action | | |
| Health-1: Risk of remaining contamination after alternative cleanup targets have been achieved | Minor, beneficial, local, long term ▣ | Moderate, negative, local, long term ◉ | None | N/A |
| Health-2: Health and safety hazards and risks during demolition and proposed remediation activities (material exposure hazards, operational safety hazards, structural hazards, dust exposure, and natural hazards) | Moderate, negative, local, short term ◉ | Moderate, negative, local, long term ◉ | Health BMP-1<br>Health BMP-2<br>Health BMP-3<br>Air Quality MM-3 | Negligible, negative, local, long term ○ |
| **Overall Alternative Impact** | Moderate, negative, local, short term ◉ | Moderate, negative, local, long term ◉ | Health BMP-1<br>Health BMP-2<br>Health BMP-3<br>Air Quality MM-3 | Negligible, negative, local, long term ○ |
| | Minor, beneficial, local, long term ▣ | Moderate, negative, local, long term ◉ | None | N/A |

Notes:
● or ■ = Significant
◉ or ◘ = Moderate
⭘ or ▣ = Minor
○ or □ = Negligible
Circular symbols represent negative impacts while square symbols represent beneficial impacts, and the degree to which the symbol is filled represents the severity of the impact.

BMP = best management practice
MM = mitigation measure

[a] Potential impacts, BMPs, and mitigation measures are discussed further in Sections 4.9.1 through 4.9.3.

# 4.10 Site Infrastructure and Utilities

This subsection describes the potential impacts to site infrastructure including existing buildings and structures along with associated utility infrastructure within the ROI, defined as the area of SSFL administered by NASA, as a result of implementing the Proposed Action or the No Action Alternative. Some site infrastructure transects various remedial areas and also is located outside of remedial areas; however, because all infrastructure is being considering for demolition, the infrastructure in its entirely is considered for impact analysis.

Section 4.10.1 includes a summary of the impact analysis to the site infrastructure and utilities under the various soil and groundwater cleanup scenarios. Section 4.10.2 provides information about potential impacts and BMPs/mitigation measures applicable to site infrastructure and utilities. Section 4.10.3 provides a discussion of the No Action Alternative. Section 4.10.4 includes a summary table of impacts and corresponding BMPs and mitigation measures identified in the site infrastructure and utilities analysis. Impacts, BMPs, and mitigation measures are numbered to correspond with the summary table to indicate where impacts might occur and how BMPs and mitigation measures might offset those impacts.

This analysis considered the ongoing use of or potential need for existing infrastructure and utilities by NASA operations, other SSFL operations, or connection to offsite operations. This impact analysis presumes that following soil remediation of the site and the completion of potential operations and maintenance activities, there would be no requirement by NASA to provide and maintain buildings or utilities at the site, with the exception of utilities required to support existing GETS or future treatment systems. The identification and analysis of the infrastructure within the ROI is summarized in Section 3.2.

Sections 4.3 and 4.9 of this EIS include other related analyses, including the historic value of certain NASA-administered structures or the health and safety risks associated with contamination known to occur on certain structures. These sections would also apply to the demolition and/or mitigation of onsite infrastructure during site cleanup activities.

The following descriptions identify thresholds of impacts relevant to site infrastructure and utilities:

| Impact | Description |
|---|---|
| No Impact | No impacts to existing site infrastructure and utilities would be expected. |
| Negligible | Impacts to existing site infrastructure and utilities might occur, but would not require changes to infrastructure. |
| Minor | Impacts to existing site infrastructure and utilities would occur but infrastructure could be used and/or utilities restored with minimal effect to services. |
| Moderate | Impacts to existing site infrastructure and utilities would occur, resulting in safety risks, interruptions of service, or constraints on operation. Restoration or reinstatement of services would be possible. |
| Significant | Impacts to existing site infrastructure and utilities would occur resulting in safety risks, interruptions of service, or operational constraints. Restoration or reinstatement of services would not be possible. |
| Quality | Beneficial–would have a positive effect on the physical, social, or cultural environment.<br>Negative–would have an adverse effect on the physical, social, or cultural environment. |
| Proximity | Local–would occur within the NASA-administered property at SSFL.<br>Regional–would occur outside the NASA-administered property at SSFL. |
| Duration: | Short term–would occur only during the proposed demolition and immediate remediation period.<br>Long term–would continue beyond the proposed demolition and immediate remediation period. |

## 4.10.1 Proposed Action–Demolition, Soil Cleanup to Background Levels, and Groundwater Cleanup

### 4.10.1.1 Demolition

The NASA facilities to be demolished and associated staging areas are located in disturbed and developed areas. Demolition is expected to take roughly a year to complete. Because it is the infrastructure, described in Section 3.2 of this report, that is targeted for demolition, there is a measurable impact to the site infrastructure during this process. Since the site demolition and the site remediation schedule has not been finalized, the remainder of this section presumes that infrastructure would be present during remediation, or that demolition activities would be occurring concurrently with remedial activities.

Buildings proposed for demolition, as shown in Figure 2.2-1, are within the Expendable Launch Vehicle (ELV), Alfa/Bravo Fuel Farm, and SPA areas, and the Alfa, Bravo, Coca, and Delta Test Areas. Demolition includes removal of all infrastructure described in Section 3.2 of this report, with the exception of electrical and potentially water-supply services required for site-specific remedial technologies. Demolition is likely to begin prior to commencement of the soil cleanup activities, thus some utility infrastructure would be removed as part of the demolition and some would remain to support cleanup activities. The demolition of these facilities would be a ***negligible, negative, local,*** and ***long term*** impact on site infrastructure, because NASA no longer uses the buildings within these areas and the infrastructure supporting these buildings is no longer needed *(**Infrastructure Impact-1**).*

Building 2203, within the ELV Area, currently is used for NASA personnel offices, conference room and contractors' administration and field effort staging purposes and would be demolished as part of the proposed action. To continue to accommodate NASA personnel and contractors through the duration of the demolition and cleanup efforts, a temporary field office trailer(s) would be provided. Temporary utility service would be required to support the temporary field office trailer and would include, at a minimum, electrical and water service. These utilities would require extending the current services to support the trailer. Because utility service is already present, the impact to add such infrastructure to support the demolition and cleanup efforts would be ***minor, negative, local,*** and ***short term*** *(**Infrastructure Impact-2**).*

The Alfa, Bravo, and Coca Test Areas are Historic Districts and are eligible for listing in the NRHP. Within these historic districts, several structures are also individually eligible for listing in the NRHP. Details of the historic element of demolition of buildings in these Historic Districts are provided in Section 4.3.

Infrastructure required for ongoing soil and/or groundwater cleanup activities are discussed in the following subsection.

### 4.10.1.2 Soil Cleanup to Background

Under the Proposed Action, NASA would remediate the soils at SSFL equal to or below the Look-Up Table values provided by DTSC. The remediation of contaminated soils within the ROI would affect site infrastructure that had not been demolished preceding the remedial action. The following text addresses potential impacts of remedial actions on the site infrastructure, assuming that the infrastructure exists when site cleanup activities commence. If the site infrastructure, or portions thereof, are removed prior to cleanup efforts, these impacts would not apply.

**Excavation and Offsite Disposal**

The soil remediation areas shown in Figure 2.2-2 include 105 acres or 320,000 $yd^3$ equating to 64 percent of the contaminated soil that must be removed from SSFL because it is considered non-treatable soil and would be disposed of offsite. The remaining 180,000 $yd^3$ of treatable soil might need to be excavated if none of the remediation technologies described later in this subsection are found to be effective in meeting the Look-Up Table values. The impact on the infrastructure from excavating an estimated 500,000 $yd^3$ of contaminated soil is described in this subsection.

Figure 4.10-1 illustrates the approximate area of remediation under NASA's Proposed Action, compared to known site infrastructure. Temporary or permanent expansion of certain utilities, including electrical, potable water, and communication service, would be necessary for relatively large-scale excavation operations. These services would be required for an onsite operations field trailer. Electrical service also would be required for roadway and work area lighting, if efforts outside of normal daylight hours were expected. Additionally, water supply would be required during a long-term excavation effort to support multiple functions of the remedial action, including equipment decontamination, dust control, sanitation, emergency health and safety systems for construction personnel, and revegetation. Water use for soil remediation was estimated using recent cleanup activities by Boeing (e.g., LOX site). During a month-long soil excavation project in summer 2013, construction water use averaged approximately 200,000 gallons per day. Extrapolated for cleanup activities over the course of a year, annual water use would be approximately 185 acre-feet per year for up to 4 years of soil remediation. Utility services currently exist at SSFL but coordination with the utility providers would be required to extend the infrastructure of these systems to the remedial area. As described in its Urban Water Management Plan, Ventura County Waterworks District No. 8 supplies are expected to be 26,100 acre-feet per year in 2015 (Ventura County Waterworks District No. 8, 2011). The District works carefully with its wholesaler suppliers to ensure that supplies are sufficient to meet demands, but overall water supply adequacy is unlikely to be affected by short-term changes at the NASA-administered portion of SSFL. Because utility service is already present, the impact to add infrastructure and increase water use to support excavation and offsite disposal activities would be ***minor, negative, local,*** and ***short term*** ***(Infrastructure Impact-3).*** Assuming that cleanup activities would commence prior to the demolition of the needed site infrastructure, excavating around existing utilities would have an inherent safety concern and interruptions to service would be unavoidable. However, the restoration and reinstatement of required service would be possible.

It is anticipated that the existing buildings, natural gas, sewer, and test support infrastructure would not be required to support a remedial excavation effort. The removal of these systems might be required to remediate certain areas within the ROI; the demolition of the site infrastructure is described in Section 4.10.1.1. Because these systems would no longer be required to achieve the Look-Up Table values, the impact from excavation to these systems would be ***negligible, negative, local,*** and ***long term (Infrastructure Impact-4).***

**Excavation and Offsite Disposal with Ex Situ Onsite Treatment**

Approximately 180,000 of the 500,000 $yd^3$ of contaminated soil have been identified as treatable, as described in Section 2 of this report. Ex situ onsite remedial treatments are being evaluated at this site; potential technology candidates to achieve the Look-Up Table values include Soil washing, land farming, chemical oxidation, and thermal desorption. The application of a chemical oxidation additive to soils being land farmed also is being evaluated.

The impacts from the excavation of approximately 320,000 $yd^3$ in this scenario would be similar to those described in the previous excavation and offsite disposal section. The impacts of ex situ treatment options on the infrastructure at SSFL are discussed in the following bullets:

- ***Potable Water System, Electrical, and Communication Systems.*** As shown in Figure 4.10-1, the listed infrastructure exists in proposed environmental cleanup areas under the Proposed Action. During environmental cleanup activities, potable water, electrical, and communication delivery lines located in the cleanup areas would require rerouting to support the operation. Rerouting the water supply would require coordination with Ventura Water Works, electrical with Southern California Edison (SCE), and communications with AT&T or a separate wireless service provider, during environmental cleanup activities within the ROI. Interruptions to the fresh water supply, electrical, and communication lines would not affect offsite receptors. There would be slight interruptions to service onsite while the required utilities are rerouted; however, this would only be during the initial startup of a selected ex situ remedy. Potable water use would be used for dust control and other purposes similar to excavation and offsite disposal (i.e., up to 185 acre-feet per year). The effect of ex situ treatment activities would have a ***minor, negative, local,*** *and* ***short term*** impact on the potable water, electrical, and communication systems ***(Infrastructure Impact-5)*** within the ROI**.**

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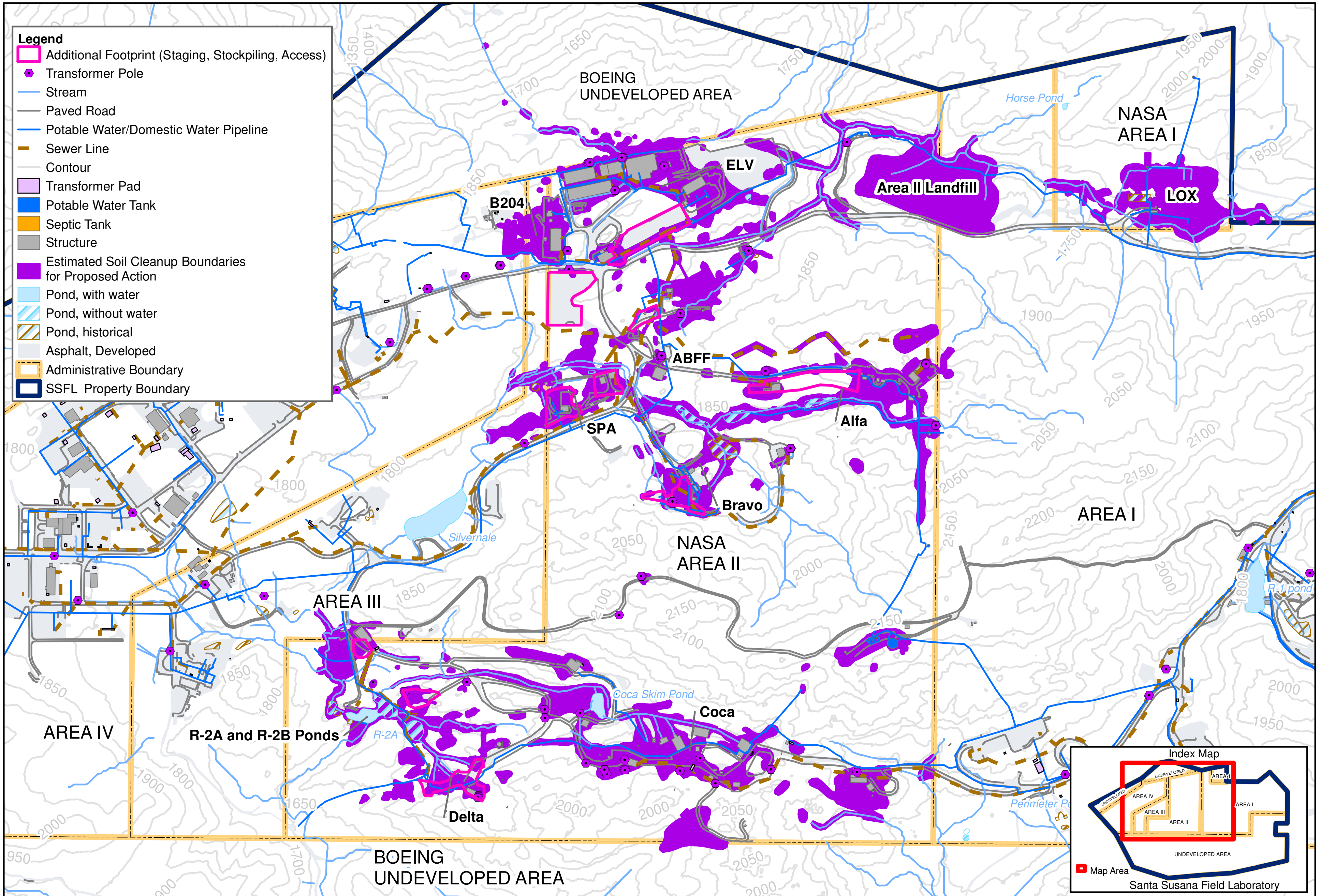


0 500 1,000 2,000 Feet
0 150 300 600 Meters

02-Apr-2013
Drawn By:
A. Cooley

**Figure 4.10-1**
**Potential Infrastructure Impacts Under the Proposed Action**
**NASA - Santa Susana Field Laboratory**
**EIS for Proposed Demolition and Environmental Cleanup**

Map Document: O:\NASA\SSFL\maps\EIS_2011\EIS_ProposedRemediation.mxd

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- ***Buildings, and Natural Gas, Sewer, and Test Support Systems***. Buildings and the listed utilities are located throughout the ROI. The ex situ remedial options being considered for cleanup at SSFL would not require the use of existing structures, nor would they require the services of the utility infrastructure listed here. Ex situ technologies could be planned and staged away from buildings and these systems until the demolition schedule was complete; the application of ex situ treatment at the site would not affect the buildings, natural gas pipelines, sewer system, and test support infrastructure remaining onsite. However, if these systems exist within an area targeted for ex situ treatment, the portions of the infrastructure within the ROI would need to be removed before remediation could continue, or the soil surrounding infrastructure present in the treatment area would need to carefully be excavated. Therefore, the impact would be ***negligible, negative, local,*** and ***long term (Infrastructure Impact-6)***.

The use of ex situ technologies could be applied to a maximum of 36 percent of the total volume of soil to be cleaned up within the ROI. The combined impact of excavation with offsite disposal and impacts from ex situ treatment defaults to the greater impact from the excavation effort. The excavation, outside of accounting for a larger targeted volume, would be expected to address the top 1 to 2 ft of soil across all cleanup areas. This would include the surface soil in areas identified as treatable. The cumulative impact of excavation and ex situ soil treatment within the ROI would be ***minor, negative, local,*** and ***short term (Infrastructure Impact-3)***.

**Excavation and Offsite Disposal with In Situ Onsite Treatment**

In situ remedial actions are also being evaluated to address the 180,000 $yd^3$ of soil identified as treatable. Intrusive in situ technologies (including SVE, chemical oxidation, bioremediation, and MNA) would require utility services (electrical for SVE and water for chemical oxidation and bioremediation) to construct and operate the remediation technology.

The impacts from the excavation of approximately 320,000 $yd^3$ in this scenario would mimic those described in the Excavation and Offsite Disposal subsection. The following bullets discuss the impacts:

- ***Potable Water System, Electrical, and Communication Systems.*** Impacts to the listed portions of the infrastructure are similar to those discussed under the ex situ treatment scenario. During environmental cleanup activities, potable water, electrical, and communication delivery lines located in the cleanup areas would require rerouting to support the operation. Rerouting the water supply would require coordination with Ventura Water Works, electrical with SCE, and communications with AT&T or a separate wireless service provider, during environmental cleanup activities within the ROI. Interruptions to the fresh water supply, electrical, and communication lines would not affect offsite receptors. There would be slight interruptions to service onsite while the required utilities are rerouted; however, this would only be during the initial startup of a selected in situ remedy. Potable water use would be used for dust control and other purposes similar to excavation and offsite disposal (i.e., up to 185 acre-feet per year). The effect of in situ treatment activities would have a ***minor, negative, local,*** and ***short-term*** impact on the potable water, electrical, and communication systems ***(Infrastructure Impact-7)*** within the ROI**.**

- ***Buildings, and Natural Gas, Sewer, and Test Support Systems***. Buildings and the listed utilities are located throughout the ROI. The in situ remedial options being considered for cleanup at SSFL would not require the use of existing structures, nor would they require the services of the utility infrastructure listed here. Differing from the ex situ scenario, the in situ treatment approach inherently must be conducted as stages within the targeted treatment area. If infrastructure exists within a treatable area when an in situ technology is to be applied, that infrastructure must first be demolished or rerouted before cleanup activities can occur. However, because these utilities and the site buildings are scheduled for demolition, and the listed utilities would not be required to conduct cleanup activities, the impact would be ***negligible, negative, local,*** and ***long term (Infrastructure Impact-8)***. The impact rating would drop from "minor," as noted in the preceding bullet, to "negligible," because the reconnection of these utilities would not be required to support the cleanup effort.

The use of in situ technologies could be applied to a maximum of 36 percent of the total volume of soil to be cleaned up within the ROI. The combined impact of excavation with offsite disposal and in ex situ treatment would default to the greater impact from the excavation effort. The excavation, outside of accounting for a larger targeted volume, would be expected to address the top 1 ft of soil across all cleanup areas. This would include the top 1 ft of soil in areas identified as treatable. The cumulative impact of excavation and in situ soil treatment within the ROI would be ***minor, negative, local,*** and ***short term (Infrastructure Impact-3)***.

#### 4.10.1.3 Groundwater Cleanup

Groundwater remedial actions proposed for the site also might affect the infrastructure needs within the ROI if utilities were required to conduct the groundwater remedial effort. Although specific details of infrastructure requirements for groundwater cleanup are not known, typically there are needs for electrical services, potable water, and other task-specific utilities. Efforts to precede the groundwater cleanup with the soil cleanup are likely within a specific area requiring a remedial action; however, some overlap would be anticipated to meet cleanup timeline goals.

Because task-specific utilities would be provided to groundwater remedial systems on an as-needed basis, and temporary structures that might be needed would be supplied as part of the groundwater treatment system, the impacts would be ***minor, negative, local,*** and ***short term (Infrastructure Impact-9)***.

### 4.10.2 Best Management Practices and Mitigation Measures

This subsection provides a brief description of impacts previously discussed in detail, along with corresponding mitigation measures and BMPs. BMPs are defined as actions required by law or an industry standard included in the Proposed Action activities. Mitigation is an action which would benefit the environment, but must be agreed to by agency stakeholders and NASA. Agreed upon mitigation measures would be provided in the ROD. These impacts, BMPs, and mitigation measures are numbered to correspond to the impact summary table provided in Section 4.10.4.

***Infrastructure BMP-1:*** Prior to excavation activities, NASA would be required by California law (California Government Code Sec. 4216, *et seq.*) to contact California's Dig Alert and potentially a third-party utility-locating service to mark existing utility lines correctly within and near the remediation areas. In situations where utility lines required temporary disconnection or a permanent relocation, coordination with the utility provider would minimize the impact of remedial activities. Coordination with in-state utility service providers during intrusive remedial or investigative work is common and considered a BMP. With this BMP, ***Infrastructure Impact-3*** would be reduced from ***moderate*** to ***minor.***

***Infrastructure Mitigation Measure-1:*** The buildings (except those protected as historical sites), and portions of the existing utilities (natural gas, sewer, and test support lines) would not be required during remedial operations. By scheduling the demolition and removal of these portions of the site infrastructure before remedial actions commence, NASA would be able to remove the impact of these features on the progress of the remedial effort. Because these systems would no longer physically exist within the ROI, ***Infrastructure Impacts-4, 6,*** and ***8*** would be reduced from ***negligible*** to ***no impact.***

### 4.10.3 No Action Alternative

Under the No Action Alternative, there would be no demolition and no soil or groundwater remediation beyond the GETS and ISRA activities currently being conducted under separate regulatory direction. It would be anticipated that the existing infrastructure at SSFL would remain.

There would be ***no impact*** on the site infrastructure or utilities under the No Action Alternative.

### 4.10.4 Summary of Impacts, Best Management Practices, and Mitigation Measures

Table 4.10-1 provides a summary of the impacts on site infrastructure and utilities, as described in this subsection. Impact and mitigation numbering previously described correspond to Table 4.10-1. The specific mitigation and corresponding impact are provided, followed by a resulting impact level if mitigation were applied successfully. Table 4.10-1 concludes with an overall alternative impact level, based on the highest level of impact identified in the analysis.

TABLE 4.10-1
**Summary of Site Infrastructure Impacts, Best Management Practices, and Mitigation Measures**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| **Impacts [a]** | **Project Alternatives [a]** | | **Best Management Practices and Mitigation Measures [a]** | **Impact After Best Management Practices and Mitigation Measures Implementation[a]** |
|---|---|---|---|---|
| | **Proposed Action** | **No Action** | | |
| Infrastructure-1: Demolition of existing buildings, structures, and utilities[b] | Negligible, negative, local, long term ○ | No impact ▽ | None | N/A |
| Infrastructure-2: Temporary expansion of existing utilities, to support in-field operations center for demolition and remediation | Minor, negative, local, and short term **O** | No impact ▽ | None | N/A |
| Infrastructure-3: Interruption of or changes to existing utilities due to soil excavation activities that includes electrical, potable water system, natural gas, sewer and communication system | Minor, negative, local, short term **O** | No impact ▽ | Infrastructure BMP-1 | Minor, negative, local, short term **O** |
| Infrastructure-4: Interruption of natural gas or electrical services [c] | Negligible, negative, local, long term ○ | No impact ▽ | Infrastructure-MM-1 | No impact ▽ |
| Infrastructure-5: Interruption of or changes to potable water system, electrical, and communication system for ex situ soil treatment technologies | Minor, negative, local, short term **O** | No impact ▽ | None | N/A |
| Infrastructure-6: Interruption to Buildings, and natural gas, sewer, and Test Support Systems for ex situ soil treatment technologies | Negligible, negative, local, long term ○ | No impact ▽ | Infrastructure-MM-1 | No impact ▽ |
| Infrastructure-7: Interruption of or changes to potable water system, electrical, and communication system for in situ soil treatment technologies | Minor, negative, local, short term **O** | No impact ▽ | None | N/A |

TABLE 4.10-1
**Summary of Site Infrastructure Impacts, Best Management Practices, and Mitigation Measures**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Impacts [a] | Project Alternatives [a] | | Best Management Practices and Mitigation Measures [a] | Impact After Best Management Practices and Mitigation Measures Implementation[a] |
|---|---|---|---|---|
| | Proposed Action | No Action | | |
| Infrastructure-8: Impact to buildings, and natural gas, sewer, and test support systems for in situ soil treatment technologies | Negligible, negative, local, long term ○ | No impact ▽ | Infrastructure-MM-1 | No impact ▽ |
| Infrastructure-9: Impact to current SSFL infrastructure considering groundwater cleanup actions | Minor, negative, local, short term ⭘ | No impact ▽ | None | N/A |
| **Overall Alternative Impact** | Minor, negative, local, short term ⭘ | No impact ▽ | Infrastructure-BMP-1<br>Infrastructure-MM-1 | Minor, negative, local, short term ⭘ |

Notes:
● or ■ = Significant
◉ or ◘ = Moderate
⭘ or ▣ = Minor
○ or □ = Negligible
▽ = No impact
Circular symbols represent negative impacts while square symbols represent beneficial impacts, and the degree to which the symbol is filled represents the severity of the impact.

BMP = best management practice
MM = mitigation measure

[a] Potential impacts, BMPs, and mitigation measures are discussed further in Sections 4.10.1 through 4.10.3.

# 4.11 Noise

This subsection describes the potential noise impacts within the ROI, defined as SSFL and local access routes leading to SSFL that could result from implementing the Proposed Action or the No Action Alternative.

Section 4.11.1 includes a summary of the impact analysis to the site noise under the various soil and groundwater cleanup scenarios. Section 4.11.2 provides information about potential impacts and mitigation measures applicable to site noise. Section 4.11.3 provides a discussion of the No Action Alternative. Section 4.11.4 includes a summary table of impacts and mitigation measures identified in the site noise analysis. Impacts and mitigation measures are numbered to correspond with the summary table to indicate where impacts might occur and how mitigation measures might offset those impacts.

Noise contours for the existing environment were developed by DOE using the Federal Highway Administration (FHWA) Traffic Noise Model and on existing traffic counts gathered during the field measurements (Urban Crossroads, 2011). Existing levels were then compared to estimated future noise level contours associated with the Proposed Action to evaluate the potential for impacts. The DOE analysis assumed that up to 142 trucks per day would use the designated haul routes. This estimate assumes 71 trucks would drive the haul routes to the site and all 71 trucks would leave the site and drive back through the haul routes, for a total of 142 trucks per day using the designated haul routes. The added 142 trucks would result in noise levels between 55- and 61-decibel (A-weighted) (dBA) community noise exposure levels (CNELs) along the designated haul routes at a distance of 100 ft, resulting in an estimated 3-dBA increase in future levels above existing levels.

The noise contours developed as part of the DOE noise analysis were used to assess impacts qualitatively as part of the proposed project. To represent a realistic upper bounds analysis, it was assumed that all trucks would use a single route. If trucks were divided to use multiple routes, the noise levels would decrease accordingly.

The following descriptions identify the thresholds of impacts relevant to the noise analysis:

| Impact | Description |
|---|---|
| No Impact | No change in noise conditions would be expected. |
| Negligible | Changes in noise conditions would be expected to increase by less than 3 dBA and the resulting levels would comply with applicable noise standards. A change of 3 dBA generally would be considered as a barely perceivable difference. |
| Minor | Impacts would result in an increase in noise conditions between 3 and 5 dBA. Such a 5-dBA change would be readily perceivable. |
| Moderate | Impacts would result in a measurable and consequential change to noise conditions, which would equate to an increase between 5 and 10 dBA. A 10-dBA change would be considered a doubling of the noise level. |
| Significant | Impacts could result in a severe change to noise conditions; this could involve a noise increase greater than 10 dBA and also could exceed the local noise ordinances. |
| Quality: | Beneficial–would have a positive effect on the physical, social, or cultural environment.<br>Negative–would have an adverse effect on the physical, social, or cultural environment. |
| Proximity: | Local–would occur within and along roads accessing the NASA-administered property at SSFL.<br>Regional–would occur outside the local roadway network. |
| Duration: | Short term–would occur only during the proposed demolition and immediate remediation period.<br>Long term–would continue beyond the proposed demolition and immediate remediation period. |

## 4.11.1 Proposed Action–Demolition, Soil Cleanup to Background Levels, and Groundwater Cleanup

The primary impacts on the noise environment would result from truck traffic along the haul routes accessing SSFL and from onsite demolition and environmental cleanup activities. Because these activities likely would occur concurrently and would be similar in nature, this analysis discusses demolition and environmental cleanup activities collectively in the following subsections.

### 4.11.1.1 Demolition

Existing noise levels in the NASA-administered portion of SSFL range from 52- to 61-dBA CNEL at a distance of 100 ft. Proposed demolition would result in up to 3,660 additional truck trips occurring over a staggered schedule between 2014 and 2016, between 7:00 a.m. and 7:00 p.m. Throughout 2016, it is assumed that up to an additional 142 one-way trips would occur associated with the proposed environmental cleanup activities, if the excavation and offsite disposal approach is implemented, and replacement of approximately one-third of the excavated material with backfill, assuming this material is hauled from an offsite source. Engine breaking by heavy construction vehicles also would increase noise levels. The added heavy truck traffic from demolition and environmental cleanup activities would result in a 3-dBA change in noise levels along the designated haul routes at a distance of 100 ft. For perspective, changes in noise levels of 3 dBA are barely perceptible to the human ear (construction impact on wildlife is discussed in Section 4.4). The vehicle traffic generated by construction workers accessing and leaving SSFL would result in less than a 4 percent increase in peak hour traffic volumes. However, under the Proposed Action, the frequency and duration of truck traffic would be measurably and noticeably higher than the existing conditions; as such, the increase would be perceptible. Noise impacts from increased traffic volumes would be expected to be ***minor, negative, local,*** and ***short term*** for an estimated period of 3 years *(**Noise Impact-1**)*.

Demolition equipment associated with the Proposed Action would also generate onsite noise. The types of equipment used for demolition would be similar to equipment commonly used for construction including backhoes, bulldozers, loaders, dump trucks, and paving equipment. Typical noise levels from these types of equipment have been measured and published in various reference documents. One of the most recent and complete compilations of construction equipment noises is the Roadway Construction Noise Model (RCNM) prepared by the FHWA in the *Roadway Construction Noise Model User's Guide* (FHWA, 2006).

A review of the RCNM indicated that the loudest equipment generally emits noise in the range of 80 to 90 dBA at 50 ft. Noise at any specific receptor would be dominated by the closest and loudest equipment. The types and numbers of construction equipment near any specific receptor location would vary over time. To make reasonably conservative estimates of noise resulting from demolition activities onsite, the following scenario was modeled:

- One piece of equipment generating a reference noise level of 85 dBA (at a 50-ft distance generating maximum noise 40 percent of the time) located on a property line
- Two pieces of equipment generating a reference noise level of 85 dBA (generating maximum noise 40 percent of the time) located 50 ft farther away on a property line
- Two more pieces of equipment generating a reference noise level of 85 dBA (generating maximum noise 40 percent of the time) located 100 ft farther away on a property line

Table 4.11-1 provides demolition equipment noise levels at various distances, based on this scenario. These estimated noise levels would be considered conservative because the only attenuation mechanism taken into account was atmospheric divergence. Additional attenuation would be provided by ground effects, atmospheric absorption, and possibly the barrier effect of terrain features. This additional attenuation was not considered in the evaluation.

TABLE 4.11-1
**Equipment Noise Levels versus Distance**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Distance from Property Line (ft) | $L_{eq}$ Noise Level (dBA) |
|---|---|
| 50 | 83 |
| 100 | 79 |
| 200 | 74 |
| 400 | 69 |
| 800 | 63 |
| 1,600 | 58 |
| 3,200 | 52 |
| 6,400 | 46 |
| Note:<br>$L_{eq}$ = equivalent noise level | |

The SSFL property boundary is located approximately 1,000 ft from the structures proposed for demolition. At that distance, the $L_{eq}$ noise level from the demolition equipment would be approximately 61 dBA, which would be below the construction noise limits for non-stationary equipment during daytime hours, as outlined in the county noise ordinance (Los Angeles, 1974). The nearest sensitive receptor is 1.25 miles from the NASA-administered area. Demolition and construction noise impacts on the NASA-Administered property would be ***minor, negative, local,*** and ***short term*** ***(Noise Impact-1).***

### 4.11.1.2 Soil Cleanup to Background

**Excavation and Offsite Disposal**

Excavation and offsite disposal would require large numbers of offsite truck traffic to remove approximately 500,000 $yd^3$ of contaminated soil. Throughout 2016, it is assumed that, apart from the noise associated with demolition-related truck trips along local roadways, an additional 142 one-way trips per day (assuming 5 days per week, 7:00 a.m. and 7:00 p.m.) would occur associated with the proposed environmental cleanup activities, if the excavation and offsite disposal approach is implemented, and replacement of approximately one-third of the excavated material with backfill, assuming these clean soils were hauled from an offsite source. Excavation and backfill hauling would continue from 2016 through completion, planned to be in 2017. The same noise impacts associated with heavy trucks noted in the demolition analysis would continue for the full four year duration. Excavation and offsite disposal noise impacts would be ***minor, negative, local,*** and ***short term*** ***(Noise Impact-2).***

However, if successful implementation of a soil remediation technology (other than Excavate and Offsite Disposal) would reduce the volume of contaminated soil requiring offsite disposal to 320,000 $yd^3$, the number of one-way truck trips would be reduced to 90 trucks per day (applying the same assumptions of 5 days per week, 7:00 a.m. and 7:00 p.m. and one-third of the excavated material required backfill hauled in from an offsite source). The estimated impact for the one-way truck trips would result in an increase of 3-dBA change in noise levels along the designated haul routes at a distance of 100 ft. resulting in a ***minor, negative, local,*** and ***short-term*** impact for an estimated period of 4 years ***(Noise Impact-2).***

**Excavation and Offsite Disposal with Ex Situ Onsite Treatment**

Onsite ex situ soil cleanup approaches would require equipment and trucks to access SSFL, but truck and equipment use would largely remain onsite. These activities would occur at a great enough distance to be imperceptible to offsite receptors. Therefore, impacts resulting from soil remediation activities would be ***minor, negative, local,*** and ***short term** (**Noise Impact-1**)* caused primarily by one round trip of equipment and trucks that would access and leave SSFL before environmental cleanup activities began and after their completion.

**Excavation and Offsite Disposal with In Situ Onsite Treatment**

Onsite in situ soil cleanup approaches would require equipment and trucks to access SSFL, but truck and equipment use would largely remain onsite. These activities would occur at a great enough distance to be imperceptible to offsite receptors. Therefore, impacts resulting from soil remediation activities would be ***minor, negative**, **local***, and ***short term*** (***Noise Impact-1**)* caused primarily by one round trip of equipment and trucks that would access and leave SSFL before environmental cleanup activities began and after their completion.

#### 4.11.1.3 Groundwater Cleanup

Similar to on site soil cleanup, groundwater cleanup approaches would require equipment and trucks to access SSFL, but truck and equipment use would largely remain onsite. These activities would occur at a great enough distance to be imperceptible to offsite receptors. Therefore, impacts resulting from groundwater remediation activities, would be ***minor, negative, local,*** and ***short term** (**Noise Impact-1**)***,** caused primarily by one round trip of equipment and trucks that would access and leave SSFL before environmental cleanup activities began and after their completion.

### 4.11.2 Mitigation Measures

This subsection provides a brief description of impacts previously discussed in detail, along with corresponding mitigation measures. Mitigation is an action that would benefit the environment, but must be agreed to by agency stakeholders and NASA. Agreed-upon mitigation measures would be provided in the ROD. These impacts and mitigation measures are numbered to correspond to the impact summary table provided in Section 4.11.4.

***Noise Mitigation Measure-1:*** NASA would limit proposed demolition and environmental cleanup activities and hauling to daytime hours.

***Noise Mitigation Measure-2*****:** Construction equipment and trucks would be maintained in good working order, construction equipment and trucks would be maintained per manufacturers' recommendations.

Implementation of ***Noise Mitigation Measures-1*** and ***2*** would result in the noise impacts remaining ***negligible, negative, local,*** and ***short term.***

### 4.11.3 No Action Alternative

Under the No Action Alternative, noise resulting from proposed demolition and environmental cleanup activities onsite and the corresponding heavy truck traffic along the haul routes would not occur. The noise environment would remain at an estimated 52 to 61 dBA CNEL, which includes ongoing activities at SSFL, some of which include offsite construction and haul trucks. As a result, noise impacts under the No Action Alterative would be considered ***negligible, negative, local*****,** and ***long term** (**Noise Impacts-1 and 2**).*

### 4.11.4 Summary of Impacts and Mitigation Measures

Table 4.11-2 provides a summary of the impacts on noise, as described in this section. Impacts and mitigation measure numbering correspond to Table 4.11-2. The mitigation measure and corresponding impact are provided, followed by a resulting impact level if the mitigation measure is applied successfully. Table 4.11-2 concludes with an overall alternative impact level, based on the highest level of impact identified in the analysis.

TABLE 4.11-2
**Summary of Noise Impacts and Mitigation Measures**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Impacts[a] | Project Alternatives[a] | | Mitigation Measures[a] | Impact After Mitigation Measures Implementation[a] |
|---|---|---|---|---|
| | **Proposed Action** | **No Action** | | |
| Noise-1: Noise generated from onsite equipment, trucks, and demolition and construction activities | Minor, negative, local, short term<br>⭘ | Negligible, negative, local, long term<br>○ | Noise MM-1<br>Noise MM-2 | Negligible, negative, local, short term<br>○ |
| Noise-2: Noise generated from truck hauling activities during daylight hours associated with proposed demolition and environmental cleanup activities | Minor, negative, local, short term<br>⭘ | Negligible, negative, local, long term<br>○ | Noise MM-1<br>Noise MM-2 | Negligible, negative, local, short term<br>○ |
| **Overall Alternative Impact** | Minor, negative, local, short term<br>⭘ | Negligible, negative, local, long term<br>○ | Noise MM-1<br>Noise MM-2 | Negligible, negative, local, short term<br>○ |

Notes:
● or ■ = Significant
◉ or ▣ = Moderate
⭘ or ◘ = Minor
○ or □ = Negligible
Circular symbols represent negative impacts while square symbols represent beneficial impacts, and the degree to which the symbol is filled represents the severity of the impact.

MM = mitigation measure

[a] Potential impacts and mitigation measures are discussed further in Sections 4.11.1 through 4.11.3.

# 4.12 Hazardous and Nonhazardous Materials and Waste

This subsection provides a discussion of potential effects within the ROI on human health and the environment from hazardous materials as well as hazardous and nonhazardous wastes that might be generated during implementation of the Proposed Action or the No Action Alternative. Disposal facilities licensed to accept certain types of waste were identified for consideration and are discussed in Section 2.2.2. The ROI selected for this evaluation includes the NASA-administered property of SSFL (Area I [LOX Plant] and Area II) and roadways accessing the NASA property, including primarily Black Canyon and Woolsey Canyon Road.

Section 4.12.1 includes a summary of the impact analysis to the site hazardous and nonhazardous materials and waste under the various soil and groundwater cleanup scenarios. Section 4.12.2 provides information about potential impacts and BMPs and mitigation measures applicable to site hazardous and nonhazardous materials and wastes. Section 4.12.3 provides a discussion of the No Action Alternative. Section 4.12.4 includes a summary table of impacts and corresponding BMPs and mitigation measures identified in the site hazardous and nonhazardous materials and waste analysis. Impacts, BMPs, and mitigation measures are numbered to correspond with the summary table to indicate where impacts might occur and how BMPs and mitigation measures might offset those impacts.

To evaluate the potential effects of wastes and hazardous materials, the methodology applied relevant to this impact analysis included a review of the following:

- The *Standard Operating Procedures: Building Demolition Debris Characterization and Management for Santa Susana Field Laboratory* (NASA, 2011a), which provides building surveys, a demolition schedule, and procedures for sampling and characterizing NASA's remaining buildings to evaluate potential contamination and to assess appropriate handling methods for managing and disposing demolition debris.
- The five RI reports for the SMOU and CFOU (NASA, 2008b, 2009a, 2009b; MWH, 2007b; 2009a), which include site characterization of soil and groundwater conditions, as well as human health and ecological risk assessments performed throughout the NASA-administered property.
- Additional site characterization data for soil evaluated from Field Sampling Plan activities (NASA, 2011c).
- Federal, state, and RWQCB requirements.

Analysis of the capacity of the regional landfills show that daily load rates and remaining capacity are able to accommodate the estimated 500,000 $yd^3$ of soil anticipated to be removed from the site (County of Los Angeles, Department of Public Works, 2012; State of Nevada, 2011). Potential hazards and impacts were identified and compared against the existing known conditions at the site, as discussed in detail throughout this section.

The following descriptions identify thresholds of impacts relevant to the hazardous and nonhazardous materials and waste analysis:

| Impact | Description |
|---|---|
| No Impact | No impacts from uncontaminated, nonhazardous, and hazardous materials and waste would be expected. |
| Negligible | Increases in uncontaminated, nonhazardous, and hazardous materials and waste streams would not be detectable and would not approach disposal facility capacity. There would be no new areas or releases of contamination. |
| Minor | Increases in uncontaminated, nonhazardous, and hazardous materials and waste streams would be measurable, but wastes would be within the capacity of the affected landfill or treatment system to absorb the change. |
| Moderate | Increases in uncontaminated, nonhazardous, and hazardous materials and waste streams would be measurable, but wastes would be within the capacity of the affected landfill or treatment system to absorb the change. Project activities could result in disturbance to human health and the environment from hazardous materials and waste. |

| Impact | Description |
|---|---|
| Significant | Increases in uncontaminated, nonhazardous, and hazardous materials and waste streams would be measurable; wastes would not be within the capacity of the affected landfill or treatment system to absorb the change; resulting impacts could be severe and long lasting. Project activities would result in disturbance to human health and the environment from hazardous materials and waste. |
| Quality: | Beneficial–would have a positive effect on the physical, social, or cultural environment.<br>Negative–would have an adverse effect on the physical, social, or cultural environment. |
| Proximity: | Local–would occur within the NASA-administered property at SSFL.<br>Regional–would occur outside the NASA-administered property at SSFL. |
| Duration: | Short term–would occur only during the proposed demolition and immediate remediation period.<br>Long term–would continue beyond the proposed demolition and immediate remediation period. |

## 4.12.1 Proposed Actions–Demolition, Soil Cleanup to Background Levels, and Groundwater Cleanup

### 4.12.1.1 Demolition

Demolishing the test stands, buildings, and ancillary structures on the NASA-administered property at SSFL would generate waste materials including hazardous wastes, nonhazardous wastes, mixed wastes, and/or other classifications with specific management or disposal requirements.

Table 4.12-1 lists common materials that could be present in the buildings and structural components considered for demolition at the site, including both hazardous and nonhazardous wastes.

NASA would characterize materials proposed for demolition and removal in two ways. The first approach, in situ characterization, would characterize materials in place before demolition to assist in efforts to segregate nonhazardous from hazardous wastes or from incompatible wastes during demolition, as well as to identify recyclable nonhazardous waste. Hazardous wastes and recyclable waste generally would be loaded directly into appropriate containers for transport and offsite disposal or recycling. In situ characterization would be the most direct and easiest approach, with the lowest risk of material release, so it would be used as the preferred approach whenever possible. This approach includes the removal of lead-based paint, asbestos, and other potentially hazardous materials from the structures, where possible prior to demolition of nonhazardous building materials.

The second approach, which NASA would use in addition to (rather than in place of) the first approach, would characterize contained materials as hazardous or nonhazardous after demolition and before materials were loaded onto trucks or trailers for transport to an approved offsite waste facility. Because the first approach would remove a majority of the hazardous materials that could be removed safely from the facilities to be demolished, NASA would use the second approach for materials not externally accessible or unsafe to evaluate in situ.

Material content would be confirmed before transfer offsite. Uncontaminated waste (often referred to as municipal solid waste, or construction and demolition waste), would be recycled where possible, or possibly deposited in the Antelope Valley Class III Landfill in Palmdale, California. Hazardous wastes, both solid and liquid, would possibly be delivered to the U.S. Ecology-permitted offsite treatment, storage, and disposal (TSD) facility in Beatty, Nevada, for treatment and/or disposal. Low-level radioactive waste (LLRW), if present, would be transported to Energy Solutions in Clive, Utah, for disposal. These are the same facilities currently being used for ongoing SSFL activities.

TABLE 4.12-1
**Typical Wastes Generated During Demolition Activities**
*NASA SSFL EIS for the Proposed Demolition and Environmental Cleanup*

| Waste | Origin |
|---|---|
| ***Nonhazardous Waste*** | |
| Refuse (plastic, paper, aluminum cans, glass bottles, etc.) | Demolition crew |
| Glass | Demolition |
| Wood | Demolition |
| Concrete | Demolition |
| Metal | Demolition |
| Sanitary waste | Portable toilet holding tanks |
| Soil | Foundation excavation |
| Empty hazardous material containers | Demolition activities |
| Waste oil | Demolition equipment |
| Waste oil filters | Demolition equipment |
| Oily rags, oil sorbent | Small spill clean up |
| Spent lead acid batteries | Demolition equipment |
| Spent alkaline batteries | Demolition equipment |
| Stormwater runoff | Demolition activities |
| Equipment washdown water | Demolition activities |
| Water from dewatering activities | Demolition activities |
| ***Hazardous Waste*** | |
| Lead-based Paint | Building surfaces, steel, window surfaces, chalking |
| Asbestos-containing Material | Floor tiles, caulking, siding, insulation, ceiling materials |
| Mercury | Fluorescent light tubes, thermostats, lighted exit signs or emergency lights, electric control panels |
| PCBs | Fluorescent light ballasts, transformers, generators, circuit breakers, caulking, paint |
| Trichlorobenzene | Fluorescent light ballasts, transformers |
| Diethylhexyl Phthalate | Fluorescent light ballasts, transformers |
| Cadmium | Lighted exit signs or emergency lights, batteries, battery chargers |
| Lead | Lighted exit signs or emergency lights, batteries, battery chargers |
| Ozone-Depleting Chemicals | Smoke detectors, fire extinguishers, drinking water fountains, air-conditioner and chiller units |
| Americium | Smoke detectors |
| Lithium | Batteries in emergency lighting |

TABLE 4.12-1
**Typical Wastes Generated During Demolition Activities**
*NASA SSFL EIS for the Proposed Demolition and Environmental Cleanup*

| Waste | Origin |
|---|---|
| Tritium | Exit signs |
| Ethylene glycol | Air-conditioner and chiller units |
| Radium | Electric control panels |
| Radiological materials | Building surfaces, equipment, and/or debris (metal, concrete, asphalt, or other) |

An estimated 99,134 tons of recyclable materials, equipment, construction and demolition (C&D) debris, and nonhazardous and hazardous material would be generated in a 12 to 18 month period during demolition activities. This includes approximately 4,750 tons of hazardous concrete, 38,000 tons of nonhazardous concrete, 8,250 tons of scrap metal, 8,134 tons of equipment for recycling or resale, 5,000 tons of C&D debris, and 35,000 tons of asphalt that would be generated during demolition activities. These components would be characterized prior to transport. The portion of this material confirmed to be uncontaminated or nonhazardous would be transported to a recycling or resale facility, if possible, or to a waste landfill. Estimated volumes of nonhazardous and hazardous waste generated under the Proposed Action could have a measurable impact on landfill capacities. Because generation of the nonhazardous and hazardous waste streams would be spread over 2 years and potentially be sent to multiple landfills, the impact would be considered ***minor, negative, regional,*** and ***long term (Haz Impact-1)***. Uncontaminated, nonhazardous, and hazardous waste materials generated during demolition activities would result in a ***minor, negative, regional,*** and ***long term*** impact to the waste stream of on landfill capacity in the region (***Haz Impact-1).***

Wastes generated during the proposed demolition activities would be characterized and contained based on their content in accordance with sitewide management plans and the demolition plan. Proper management and handling would avoid the potential for new releases of contamination and would maintain a healthy and safe working environment. Although these management procedures currently are in place, because of the broad activities across the ROI, this impact would be considered ***minor, negative, local*****,** and ***short term (Haz Impact-2)***. Additionally, dust would be generated when structures, asphalt, and concrete are removed. Although management procedures are currently in place, the impact to air quality would be considered ***minor, negative, local***, and ***short term (Haz Impact-4d).***

### 4.12.1.2 Soil Cleanup to Background

The goal of the implementation and operation of remedial technologies for the Proposed Action is the reduction or removal of hazardous material from the soil. The Proposed Action of excavation and offsite disposal would generate approximately 500,000 $yd^3$ of contaminated soil. However, successful implementation of a soil remediation technology (other than excavation and offsite disposal) would reduce the volume of contaminated soil requiring offsite disposal to 320,000 $yd^3$.

#### Excavation and Offsite Disposal

As part of the Proposed Action, some (approximately 320,000 $yd^3$) or all (approximately 500,000 $yd^3$) of the contaminated soil would be excavated and transported for offsite disposal in one or more pre-existing offsite nonhazardous or hazardous RCRA permitted landfill (contaminated soils not disposed in RCRA permitted landfills would be treated onsite). After excavation, soils would be tested to verify content to identify appropriate handling and disposal. Considerable volumes of waste for the excavation and offsite disposal technology under the Proposed Action would be expected (up to 635,000 tons [assuming 1.3 tons per $yd^3$]). If onsite treatment is used the anticipated volume of soil requiring offsite disposal is still considered large (up to 416,000 tons [assuming 1.3 tons per $yd^3$]). The reduction in soil transported offsite would Soils tested, prior to excavation, as being useful as backfill material would be retained onsite.

The types and levels of hazardous and nonhazardous waste-related impacts that might occur as a result of the Proposed Action would depend on the type of technology implemented for the environmental cleanup. For example, soils removed under the excavation and offsite disposal technology would require proper handling and/or management to avoid accidental releases of contaminants to the surface environment. The primary potential for soil contamination movement as a result of proposed remediation would be if soils were transported by water or wind movement. Monitoring would be an important component to the active remediation approaches, including MNA, to avoid new contamination migration or exposure paths. Institutional controls, including signage and fencing, would be considered a part of active remediation sites to avoid human exposure risks.

Excavated soil would be characterized and contained based on their content in accordance with a sitewide waste management plan. Proper management and handling would avoid the potential for new releases of contamination and would maintain a healthy and safe working environment. Although these management procedures currently are in place, because of the broad activities across the ROI, this impact would be considered ***minor, negative, local,*** and ***short term*** ***(Haz Impact-2****).*

The total estimated volume of soil requiring cleanup at the site could be as much as 500,000 $yd^3$. Through use of ex situ and in situ technologies this volume of soil could be reduced to 320,000 $yd^3$, therefore reducing the duration of offsite transport of materials. Environmental cleanup through the implementation of soil excavation would likely generate and contribute materials to the waste stream of the region, either by offsite transport and disposal of the entire 500,000 $yd^3$ or the reduced volume of 320,000 $yd^3$. Reduction in the volume of waste transported offsite for disposal by using onsite treatment methods would likely constitute a ***minor, negative, local, short-term*** impact ***(Haz Impact-3).***

The estimated remaining capacity for the proposed offsite landfills are provided in Table 2.2-5. For disposal of both the 500,000 $yd^3$ and the 320,000 $yd^3$ volumes of soil, offsite transport of uncontaminated and nonhazardous waste streams would be anticipated to be minimal in comparison to remaining landfill capacity and would constitute a ***negligible, negative, regional,*** and ***long-term*** impact ***(Haz Impact-4a****)*. Alternatively, hazardous waste generated during implementation and operation of remedial technologies would likely constitute a ***minor, negative, regional,*** and ***long-term*** impact to the Ventura County waste stream ***(Haz Impact-4b****)*.

Excavation of soil, for offsite transportation and disposal of the 500,000 $yd^3$ and 320,000 $yd^3$ soil volumes, would pose the risk of releasing contaminated air emissions through vapors or exposed soils, which would create an impact deemed to be potentially ***minor, negative, local,*** and ***short term (Haz Impact-4d****)*. Excavation would also include the onsite storage of fuels, lubricants, and other hazardous materials.

**Excavation and Offsite Disposal with Ex Situ Onsite Treatment**

Soil remediation technologies include the treatment of approximately 180,000 $yd^3$ combined with offsite disposal of approximately 320,000 $yd^3$ of soil. Specific impacts that could result from implementation of the ex situ soil treatment technologies considered under the Proposed Action are discussed in this subsection. The combined impact for the soil remedy would include impacts described in Section 4.12.1.2, as well as impacts associated with ex situ treatment of soil described in this subsection.

Chemical-based environmental cleanup technologies would include the use of oxidizing agents. These items would be delivered in containers which would generate empty containers as waste when contents are used, and may generate residual oxidizing agents. Offsite transport of empty containers and reclamation of oxidizing agents would be anticipated to be minimal and would constitute a ***negligible, negative, regional,*** and ***long-term*** impact ***(Haz Impact-4a****).*

Uncontaminated and nonhazardous waste streams associated with remediation activities would be anticipated to be minimal and would constitute a ***negligible, negative, regional,*** and ***long-term*** impact ***(Haz Impact-4a****).* Alternatively, hazardous waste generated during implementation and operation of remedial technologies would likely constitute a ***minor, negative, regional,*** and ***long-term*** impact to the regional waste stream ***(Haz Impact-4b****).*

Other technologies, such as land farming, would require the operation and maintenance of equipment for duration of the remedy, and the onsite storage of fuels, lubricants, and other chemicals. Various chemicals might be used in smaller volumes for treatment, and support equipment. Wastes also would be generated during set up, installation, and removal of the remedy, and the cleaning of contaminated equipment would generate wastewater. A number of technologies proposed for remediation, may require the use of filters or filter media, treatment systems, or other methods for collecting hazardous waste from the vapor. The used filters, material from the treatment system**,** and so forth would require disposal at an offsite landfill, which would result in being ***minor, negative, regional,*** and ***long-term (Haz Impact-4c).***

Many of the considered remediation technologies would pose the risk of releasing contaminated air emissions through vapors or exposed soils, which would create an impact deemed to be potentially ***moderate, negative, local,*** and ***short term (Haz Impact-4d)***. Several of the considered remediation technologies would include the onsite storage of fuels, lubricants, and other hazardous materials. These materials, if mishandled, could be released into the site, which would constitute an impact as being ***minor, negative, local to regional,*** and ***long term (Haz Impact-4e).***

Many proposed remediation technologies would require monitoring, which would generate waste from trash and consumables such as disposable gloves, broken sample bottles, and tubing, and other disposable sampling equipment. When added to the potential hazardous soil waste anticipated for offsite disposal, even with the source reduction protocol currently used by NASA (Section 2.2.1), these impacts still would be considered ***minor, negative, regional,*** and ***long term*** if the full volume were disposed offsite ***(Haz Impact-4c).***

**In situ Excavation and Offsite Disposal with In Situ Onsite Treatment**

Soil remediation technologies include the treatment of approximately 180,000 $yd^3$ and offsite disposal of approximately 320,000 $yd^3$ of soil. Specific impacts that could result from implementation of the in situ soil treatment technologies considered under the Proposed Action are discussed in this subsection. The combined impact for the soil remedy would include impacts described in Section 4.12.1.2, as well as impacts associated with ex situ treatment of soil described in this subsection.

Chemical-based environmental cleanup technologies would include the use of oxidizing agents. Enhanced bioremediation technologies would use sugars, corn syrup, and/or vegetable oils. These items would be delivered in containers which would generate empty containers as waste when contents are used, and may generate residual oxidizing or reducing agents or biological additives. Offsite transport of empty containers would be anticipated to be minimal and would constitute a ***negligible, negative, regional,*** and ***long-term*** impact ***(Haz Impact-4a).*** Alternatively, unused chemicals would likely constitute a ***minor, negative, regional,*** and ***long-term*** impact to the Ventura County waste stream ***(Haz Impact-4b).***

In situ treated soil would not be excavated and would remain in place following treatment. Soil remediation activities would generate waste from trash and consumables such as filters, empty containers, hose or tubing, disposable gloves, and other materials used to maintain the equipment and to sample the soil. Waste streams would be categorized for appropriate disposal offsite. Environmental cleanup through the implementation of remedial technologies would likely generate and contribute materials to the waste stream of the region. Uncontaminated and nonhazardous waste streams associated with remediation activities would be anticipated to be minimal and would constitute a ***negligible, negative, regional,*** and ***long-term*** impact ***(Haz Impact-4a).*** Alternatively, hazardous waste generated during implementation and operation of remedial technologies would likely constitute a ***minor, negative, regional,*** and ***long-term*** impact to the regional waste stream ***(Haz Impact-4b).***

Technologies, such as SVE, would require the operation and maintenance of pumps and other equipment for several years, and the onsite storage of fuels, lubricants, and other chemicals. Various other chemicals might be used in smaller volumes for treatment systems and for maintenance of wells, and support equipment. Wastes also would be generated during well drilling, installation, and removal, and the cleaning of contaminated equipment would generate wastewater. Systems, such as SVE blowers, would also require removal and recycling or disposal when remediation is complete. Removal and offsite disposal of equipment would be minimal and would constitute a ***negligible, negative, regional*****,** and ***long-term*** impact ***(Haz Impacts-4a** and **4b).***

A number of technologies proposed for in situ remediation, may require the use of filters or filter media, treatment systems and equipment, or other methods for collecting hazardous waste from the vapor. The used filters, material from the treatment system**,** and so forth would require disposal at an offsite landfill, which would result in a ***minor, negative, regional,*** and ***long-term*** impact ***(Haz Impact-4c)****.* Filter media, such as granular activated carbon, could be reactivated rather than disposed, which would result in the impacts being ***minor, negative, local,*** and ***short term (Haz Impact-4d).***

Many of the considered in situ remediation technologies would pose the risk of releasing contaminated air emissions through vapors emitted from the treatment systems, which would create an impact deemed to be potentially ***minor, negative, local,*** and ***short term (Haz Impact-4d)***. Several of the considered remediation technologies would include the onsite storage of fuels, lubricants, and other hazardous materials. These materials, if mishandled, could be released into the site, which would constitute a ***minor, negative, local*** to ***regional,*** and ***long-term*** impact ***(Haz Impact-4e)****.*

Many proposed remediation technologies would require monitoring, which would generate waste from trash and consumables such as disposable gloves, broken sample bottles, and tubing and other disposable sampling equipment. When added to the potential hazardous soil waste anticipated for potential offsite disposal, even with the source reduction protocol currently used by NASA (Section 2.2.1), these impacts still would be considered ***minor, negative, regional,*** and ***long term*** if the full volume were disposed offsite ***(Haz Impact-4c)****.*

These agents would be delivered in containers, which would generate empty containers as waste when contents are used and might generate residual oxidizing agents.

After remediation soils tested Soil remediation activities would generate waste from trash and consumables such as filters, hoses or tubing, empty containers, disposable gloves, plastic sheeting, and other materials used to maintain the equipment and to sample the soil. Environmental cleanup through the implementation of remedial technologies would likely generate and contribute materials to the waste stream of Ventura County.

#### 4.12.1.3 Groundwater Cleanup

The goal of the implementation and operation of remedial technologies for the Proposed Action is the reduction or removal of contaminants from the groundwater. Considered treatment technologies include MNA, pump-and-treat, vacuum extraction, heat extraction, and oxidation.

Chemical-based environmental cleanup technologies would include the use of oxidizing agents. Enhanced bioremediation technologies would use sugars, corn syrup, and/or vegetable oils. Wastes also would be generated during well drilling, installation, and removal, and the cleaning of contaminated equipment would generate wastewater. These items would be delivered in containers; those empty containers would become waste when contents had been used and might generate residual oxidizing or reducing agents or biological additives.

Other technologies, such as a GETS system or vacuum extraction, would require the operation and maintenance of pumps and other equipment for several years and the onsite storage of fuels, lubricants, and other chemicals. Various other chemicals might be used in smaller volumes for treatment systems and for maintenance of wells, treatment systems, and support equipment. Wastes also would be generated during well drilling, installation, and removal, and the cleaning of contaminated equipment would generate wastewater. A number of technologies proposed for remediation, including, pump-and-treat systems for groundwater remediation, and vacuum extraction, would require the use of filters or filter media, treatment systems, or other methods for collecting hazardous waste from the groundwater. The used filters, material from the treatment system**,** and so forth would require disposal at an offsite landfill, which would result in a ***minor, negative, regional,*** and ***long-term*** impact ***(Haz Impact-4c)****.* Filter media, such as granular activated carbon, could be reactivated rather than disposed, which would result in an impact of ***minor, negative, local,*** and ***short term (Haz Impact-4d).***

Many of the considered remediation technologies would pose the risk of releasing contaminated air emissions through vapors, which would create an impact deemed to be potentially ***minor, negative, local,*** and ***short term (Haz Impact-4d)***. Several of the considered remediation technologies would include the onsite storage of fuels, lubricants, and other hazardous materials. These materials, if mishandled, could be released into the site, which would constitute an impact being ***minor, negative, local*** to ***regional,*** and ***long term*** *(**Haz Impact-4e**).*

Many proposed remediation technologies would require monitoring, which would generate waste from trash and consumables such as disposable gloves, broken sample bottles, and tubing, bailers, and other disposable sampling equipment. When added to the potential hazardous soil waste anticipated for potential offsite disposal, even with the source reduction protocol currently used by NASA (Section 2.2.1), these impacts still would be considered ***minor, negative, regional,*** and ***long term*** if the full volume were disposed offsite *(**Haz Impact-4c**).*

## 4.12.2 Best Management Practices and Mitigation Measures

This subsection provides a brief description of impacts previously discussed in detail, along with corresponding mitigation measures and BMPs. BMPs are defined as actions required by law or an industry standard included in the Proposed Action activities. Mitigation is an action that would benefit the environment, but must be agreed to by agency stakeholders and NASA. Agreed upon mitigation measures would be provided in the ROD. These impacts, BMPs, and mitigation measures are numbered to correspond to the impact summary table provided in Section 4.12.4.

***Haz BMP-1:*** Hazardous demolition materials and wastes from demolition and from operation of remediation technologies would be handled in compliance with the applicable federal, state, and local laws and regulations, including licensing, training of personnel, accumulation limits and times, prevention and response to spills and releases, and reporting, and record keeping.

Per these regulatory standards, hazardous wastes generally would be loaded directly into bins for transport and offsite disposal; however, containment, if needed, would be in containers that prevent the release of material or hazardous content. Bins containing hazardous wastes would be kept securely closed, except when wastes were being transferred into or out of them, and would be transported for offsite disposal within the prescribed 90-day accumulation period (NASA, 2011a).

***Haz BMP-1*** also would be applied as a BMP to maintain the impact levels of ***Haz Impacts-1, 3 and 4a.*** Filter media, such as granular activated carbon, could be reactivated rather than disposed, which would result in a ***negligible, negative, regional,*** and ***long-term*** impact**.**

***Haz BMP-2:*** As required by California Health and Safety Code Chapter 6.95 and the California Code of Regulations, Title 19, a Hazardous Materials Business Plan would be developed. This plan would describe appropriate storage, containment, and safety protocols for use of hazardous materials during the remediation; emergency procedures to be followed in the event of a release; instructions for performing fueling and maintenance operations on vehicles and equipment onsite; and other protocols so that hazardous materials would be stored and handled appropriately. The BMPs outlined in the SWPPP (***Water BMP-1***, Update and Implementation of an SWPPP), including protocols for spill prevention and cleanup, also would be followed. By implementing these plans, ***Haz Impact-4e*** would be reduced to a ***negligible, negative, local,*** and ***long-term*** impact.

By implementing ***Health BMP-1*** (develop a health and safety plan), and ***Air Quality Mitigation Measure-3*** (Development of a project Dust Control Plan), the potential for accidental releases or new exposures would be maintained to an impact deemed as ***minor, negative, local,*** and ***short term*** *(**Haz Impact-2, 4b, 4c, 4d**).* Specific to the SWPPP developed as part of ***Water BMP-1,*** BMPs for the storage and use of hazardous materials, as well as spill response procedures, would be specified. Hazardous materials would be stored within secondary containment and spill kits would be placed throughout SSFL for immediate response to spills, such as those that might occur during onsite refueling. Following initial response, follow-on investigation, and cleanup of spills would be performed in accordance with the SWPPP. The SWPPP would include BMPs to control site runoff, spillage or leaks, waste disposal, stormwater exposure to hazardous materials, and drainage from hazardous and nonhazardous material storage areas *(**Haz Impact-2, 4b, 4c, 4d,*** and ***4e**).*

## 4.12.3 No Action Alternative

Under the No Action Alternative, NASA would not demolish test stands, buildings, or ancillary structures on the NASA-administered property of SSFL. NASA would not conduct soil remediation at the site or groundwater treatment beyond the GETS and ISRA activities currently being conducted. Once those ongoing remedial programs were concluded, no further remedial action would occur.

Activities associated with these ongoing remediation activities under the No Action Alternative could require the storage and use of hazardous materials, generate hazardous and nonhazardous waste materials, and require the transport of hazardous and nonhazardous waste materials. The construction activities likely would occur periodically over the operation and maintenance phase of the GETS and ISRA programs to replace structures that might become worn, clogged, or damaged. Construction impacts identified under the Proposed Action would be similar to those under the No Action Alternative, although to a much lesser degree. The impact on the hazardous, nonhazardous, and uncontaminated waste streams would be considered ***negligible, negative, regional,*** and ***long term,*** because the GETS and ISRA programs would be on a much smaller scale compared to the Proposed Action *(**Haz Impacts-1, 4a,*** and ***4b**).*

Because no further monitoring would occur under the No Action Alternative, no further waste would be generated from monitoring activities once the GETS and ISRA programs were completed. Remnant contaminant concentrations in soil and groundwater after the GETS and ISRA programs were concluded would be commensurately greater. MNA could take hundreds of years. This impact would be considered ***moderate, negative, local to regional,*** and ***long term (Haz Impacts-2, 3, 4c, 4d,*** and ***4e**).*

## 4.12.4 Summary of Impacts, Best Management Practices, and Mitigation Measures

Table 4.12-2 provides a summary of the potential impacts and mitigation measures applicable to hazardous materials and waste, as discussed in this section. Impact and mitigation numbering correspond to Table 4.12-2. The specific mitigation and corresponding impact are provided, followed by a resulting impact level if mitigation is applied successfully. Table 4.12-2 concludes with an overall alternative impact level, based on the highest level of impact identified in the analysis.

TABLE 4.12-2

**Summary of Impacts, Best Management Practices, and Mitigation Measures for Hazardous and Nonhazardous Materials and Waste**

*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Impacts[a] | Project Alternatives[a] | | Best Management Practices and Mitigation Measures[a] | Impact After Best Management Practices and Mitigation Measures Implementation[a] |
|---|---|---|---|---|
| | **Proposed Action** | **No Action** | | |
| Haz-1: Impact of uncontaminated, nonhazardous, and hazardous waste generated during demolition activities on Ventura County | Minor negative, regional, long term ⭘ | Negligible, negative, regional, long term ○ | Haz BMP-1 | Negligible, negative, regional, long-term ○ |
| Haz-2: Potential release of hazardous materials and/or waste to the environment if materials not managed properly | Minor, negative, local, short term ⭘ | Moderate, negative, local to regional, long term ◉ | Haz BMP-1<br>Haz BMP-2<br>Water BMP-1<br>Air Quality MM-3<br>Health BMP-1 | Minor, negative, local, short term ⭘ |
| Haz-3: Reduction or removal of hazardous material from the soil | Minor, negative, local, short term ⭘ | Moderate, negative, local to regional, long term ◉ | Haz-BMP-1 | Negligible, negative, local, short term ○ |
| Haz-4a: Uncontaminated and nonhazardous waste generated during implementation and operation of remedial technologies | Negligible, negative, regional, long term ○ | Negligible, negative, regional, long term ○ | Haz BMP-1 | Negligible, negative, regional, long-term ○ |
| Haz-4b: Hazardous waste generated during implementation and operation of remedial technologies | Minor, negative, regional, long term ⭘ | Negligible, negative, regional, long term ○ | Haz BMP-1<br>Water BMP-1<br>Health BMP-1<br>Air Quality MM-3 | Minor, negative, local, short term ⭘ |
| Haz-4c: Impacts of the use of filters, treatment systems, or other methods during remedial technologies for collecting contaminants from the soil and groundwater | Minor, negative, regional, long term ⭘ | Moderate, negative, local to regional, long term ◉ | Haz BMP-1 | Minor, negative, local, short term ⭘ |
| Haz-4d: Exposure to contaminants in airborne dust or vapors via inhalation, ingestion, or dermal contact | Minor, negative, local, short term ⭘ | Moderate, negative, local to regional, long term ◉ | Haz BMP-1<br>Health BMP-1<br>Water BMP-1<br>Air Quality MM-3 | Minor, negative, local, short term ⭘ |

TABLE 4.12-2
**Summary of Impacts, Best Management Practices, and Mitigation Measures for Hazardous and Nonhazardous Materials and Waste**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Impacts[a] | Project Alternatives[a] | | Best Management Practices and Mitigation Measures[a] | Impact After Best Management Practices and Mitigation Measures Implementation[a] |
|---|---|---|---|---|
| | **Proposed Action** | **No Action** | | |
| Haz-4e: Potential release of hazardous materials to the environment as a result of component failure, tank failure, or human error | Minor, negative, local to regional, long term | Moderate, negative, local to regional, long term | Haz BMP-2<br>Water BMP-1 | Negligible, negative, local, long term |
| **Overall Alternative Impact** | Minor, negative, regional, long term | Moderate, negative, local to regional, long term | Haz BMP-1<br>Haz BMP-2<br>Health BMP-1<br>Water BMP-1<br>Air Quality MM-3 | Minor, negative, regional, short term |
| | | | | |

Notes:
● or ■ = Significant
◉ or ▣ = Moderate
○ (bold) or □ (bold) = Minor
○ or □ = Negligible
Circular symbols represent negative impacts while square symbols represent beneficial impacts, and the degree to which the symbol is filled represents the severity of the impact.

BMP = best management practice
MM = mitigation measure

[a] Potential impacts, BMPs, and mitigation measures are discussed further in Sections 4.12.1 through 4.12.3.

# 4.13 Cumulative Impacts

The CEQ regulations implementing NEPA define a “cumulative impact” as follows:

> *Cumulative impact is the impact on the environment, which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes the actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time* (40 CFR Section 1508.7).

Cumulative impacts would occur if the incremental effects of the Proposed Action resulted in an increased impact when added to the environmental effects of past, ongoing, and reasonably foreseeable future activities. Reasonably foreseeable future activities are defined as those that have an application for operations pending and would occur in the same timeframe as the Proposed Action. Past activities are considered only when their impacts still would be present during implementation of the Proposed Action. For the purpose of the analysis, the proposed action impacts are based on all of the overall impact estimates of all activities. It is also assumed that the BMPs described in each resource section would be implemented.

For a past, ongoing, or reasonably foreseeable future activity to be considered in the cumulative analysis, the incremental impacts of the activity and the Proposed Action must be related in space and time. The following criteria were used to identify cumulative activities:

- Actions of a similar character that could affect the same environmental resources within the ROI (as defined in each of the resource sections)
- Actions occurring from 1955, when test stands were first constructed at SSFL, through 2017, the estimated end of cleanup activities under the Proposed Action

The cumulative impacts analysis for each resource involved the following process:

- Identify cumulative activities that might occur in the same area and timeframe as the Proposed Action (Section 4.13.1).
- Assess the resource-specific impacts resulting from the cumulative activities. If the cumulative activity was found not to occur in the same area and timeframe as the Proposed Action, it was not included in the cumulative resource analysis.
- Identify the overall potential cumulative impacts of these activities when considered together with the project-related impacts.

The level of cumulative analysis for each resource studied in this EIS varies, depending on the sensitivity of the resource to potential cumulative impacts.

## 4.13.1 Cumulative Activities

The actions discussed in this subsection have the potential to occur in either the same space or at the same time as the Proposed Action and therefore could result in cumulative impacts.

**Interim Source Removal Action (ISRA)**: Under the direction of the RWQCB Cleanup and Abatement Order (CAO), Boeing and NASA initiated the ISRA to remove surface soil contamination and to comply with waste discharge requirements established in the National Pollutant Discharge Elimination System (NPDES) permit No. CA001309. The specific objective of the ISRA RWQCB CAO is to improve surface water quality within the Outfall 008 and 009 watersheds by identifying, evaluating, and remediating areas of contaminated soil to eliminate the COCs (specifically, dioxin, cadmium, copper, lead, and mercury) that exceeded the NPDES permit limits and benchmark limits. As part of this program, NASA began soil removal activities in the northeastern portion of Area II in early November 2009. NASA currently is operating ISRA at four sites–ELV, STP, A2LF, and LOX. Approximately 4,802 $yd^3$ have been excavated, with an estimated 7,580 $yd^3$ to be removed in 2013. The excavated material is transported to offsite licensed disposal facilities, and stormwater BMPs are implemented to improve stormwater runoff quality and to minimize NPDES permit exceedances. The soil remediation goal for the ISRA was the DTSC-approved background levels; however, the goal for dioxin was slightly higher than current background levels because the watersheds were burned extensively during the 2005 Topanga Wildfire, resulting in dioxin-containing ash and debris being deposited throughout the area. Because the ISRA would be completed before the start of the Proposed Action, the ISRA effort is a past action that overlaps the Proposed Action ROI as it is likely that vegetation communities affected by the ISRA would not be rejuvenated fully before the proposed environmental cleanup is initiated. However, numerous BMPs have been implemented during the ISRA to mitigate the effects of the soil excavation activities (Boeing, 2011a), such as the following:

- Culvert modifications
- Constructing sandbag berms
- Stormwater collection, water settling, and filtration system installation
- Slope drains and rock berms
- Use of filter media and sediment basisn
- Installation of a biofilter

Additionally, excavation did not occur in sensitive vegetation communities, wetland areas, or known listed species habitat and USFWS has been consulted regarding impacts to sensitive species (MWH, 2011).

**Groundwater Extraction and Treatment System (GETS)**: An interim GETS was designed to extract groundwater from 14 wells across SSFL and to deliver water via a network of new pipelines to a centralized treatment facility located in Boeing Area I. The facility has been partially operational since October 2009, receiving groundwater extracted from a well in the southwestern portion of NASA Area II. Extracted groundwater is treated at the facility prior to offsite disposal. When the GETS is fully operational, groundwater would be delivered via the new pipelines to a large storage tank. The water would then be treated and discharged through a permitted outfall. Because of the high cost of treating water and the low discharge resulting from the GETS, the option of reinjecting treated water is being evaluated for various locations, including existing water supply wells and an area in the center of the facility. The GETS is an ongoing action and overlaps a portion of the NASA-administered property at SSFL.

**DOE Energy Technology Engineering Center (ETEC) Closure:** The ETEC, which was used for nuclear research and testing, is a 90-acre area of SSFL Area IV (leased by DOE). The research and testing activities occurred from the 1950s through the 1980s and included nuclear energy operations (development, fabrication, disassembly, and examination of nuclear reactors, reactor fuel, and other radioactive materials) and large-scale liquid sodium reactor experiments. Several incidents occurred during the operating history of the sodium reactor experiments that may have resulted in the release of radionuclides to the environment. The actual concentrations currently present depend on the residual persistence of the radionuclides in the environment after more than 30 years of decay and prior remediation efforts (Rucker, 2009). EPA undertook sampling SSFL Area IV and a portion of the northern undeveloped area that were found to be affected by these activities to evaluate contamination levels. DOE will prepare an EIS to analyze a range of remediation alternatives pertaining to cleanup of those leased areas to achieve the Look-Up Table values. The remediation project is expected to be operating by 2017, and is estimated to require the removal of a minimum of 1,700,000 $yd^3$ of soil. DOE remediation is a reasonably foreseeable action occurring adjacent to the NASA-administered property.

**Boeing SSFL Demolition and Cleanup Project:** Soil and water contamination remediation work is ongoing on Boeing-owned properties. Boeing already has removed 50,000 $yd^3$ of soil for remediation (Boeing, 2012).The DTSC is initiating an Environmental Impact Report (EIR), in accordance with the California Environmental Quality Act (CEQA), to analyze the impacts of future remediation efforts. The estimated soil removal for the Boeing project is 400,000 $yd^3$. The Boeing project is an ongoing action occurring adjacent to the NASA-administered property.

**Previous Test Stand Removal:** Test stands, ancillary facilities, and hazardous material storage tanks have been removed throughout the NASA-administered property, as well as throughout the Boeing administered areas. When possible, building and test stand foundations were left in place to minimize soil disturbance. However, when foundations were removed, the sidewalls of the resulting depression were collapsed and the sites graded to an even surface to prevent surface water ponding. The removal of these facilities constitutes a past action within the NASA-administered property.

**Topanga Wildfire:** SSFL is in an area prone to wildfires due to its warm weather and dry climate. In September 2005, 2,000 of the 2,849 acres of SSFL, including most of NASA-administered Area II, burned in the 24,000-acre Topanga Wildfire. Many site structures were damaged or destroyed; however, none of the structures were individually NRHP-eligible or contributing resources to historic districts. After the fire, BMPs were implemented to decrease the amount soil, ash, and burned vegetation migrating from the site. Wildfires produce some toxic chemicals, including dioxin, from the burning of brush and building materials. Consequently, some of the dioxin found in the remediation areas could be associated with the Topanga Wildfire. The 2005 Topanga Wildfire is a past action that affected the NASA-administered property.

**Residential Development:** No new residential developments have been proposed immediately surrounding or within a 1-mile radius of SSFL. Furthermore, no new residential developments have been proposed along Woolsey Canyon Road, Box Canyon, or Roscoe Boulevard (Ventura County New Homes Directory, 2011; Ventura County Building and Safety, 2011; Los Angeles New Homes Directory, 2011). Consequently, new residential development is not discussed further in this cumulative analysis.

**Rim of the Valley Special Resources Study:** The NPS is conducting a "special resource study" of the area known as the "Rim of the Valley Corridor," which includes the Santa Susana Mountains. The purpose of this special resource study is to determine whether any portion of the Rim of the Valley Corridor study area is eligible to be designated a unit of the national park system or added to an existing national park (NPS, 2013). While a number of alternatives have been identified in this study, it is currently unclear if the NASA-administered portions of SSFL would be part of any future national park designations by Congress. Consequently, the Rim of the Valley special resource study and future NPS designations are not carried further in this cumulative analysis.

## 4.13.2 Cumulative Impacts to Individual Resources

The following subsections explain the cumulative impacts of the Proposed Action and cumulative activities to individual resources.

### 4.13.2.1 Soils, Landslide Potential, Topography, and Paleontological Resources

The cumulative ROI for soils, landslide potential, topography, and paleontological resources is defined as the Chatsworth Formation within SSFL. This ROI is broader than the project ROI because cumulative activities affect the extent of the Chatsworth Formation geologic unit. The overall impact to soils, landslide potential, topography, and paleontological resources after the implementation of BMPs and mitigation measures is ***negligible to minor, negative, local, and long term***.

**Cumulative Activities Affecting Soils, Landslide Potential, Topography, and Paleontological Resources**

The Proposed Action could combine with the ongoing and reasonably foreseeable activities described in the following subsections to result in cumulative impacts to soils, landslide potential, topography, and paleontological resources.

***ISRA***

The ISRA project also requires excavation to bedrock of a large amount of soil within the ROI. However, BMPs have been implemented to mitigate soil erosion onsite and reduce impacts to soils (Boeing, 2011b). These impacts are isolated to the ISRA locations and because excavations include only top soils, no noticeable effect to topography or increase in landslide potential would occur. No effects to paleontological resources would be anticipated; however, if deeper site work were warranted, it would be expected to potentially affect paleontological resources, if they were present.

***Boeing Remediation and DOE ETEC Closure Projects***

The Boeing remediation and the DOE ETEC closure projects also would result in excavation of soil in the Chatsworth Formation of SSFL and the impacts on soils, topography, and landslide potential are anticipated to be similar to the Proposed Action. As with ISRA, only deeper site work would be expected to affect paleontological resources. Similar mitigation measures as those identified in Section 4.2 would be warranted.

***Previous Test Stand Removal***

In some cases, concrete foundations were left in place during test stand demolition, resulting in minimal soil disturbance. In other cases, concrete building foundations were removed, which disturbed the soil and increased landslide potential immediately beneath and adjacent to the foundation.

**Cumulative Impacts to Soils**

These activities include BMPs or mitigation measures to limit the negative impacts to soils, landslide potential, topography, and paleontological resources. Consequently, cumulative impacts are expected to remain ***negligible to minor, negative, local,*** and ***long term.***

#### 4.13.2.2 Cultural Resources

The ROI for cumulative impacts to cultural resources is defined as all of SSFL. The Proposed Action would have an overall ***significant, negative, regional,*** and ***long-term*** effect on cultural resources due to the demolition of historic structures and from excavation and disposal of 320,000 to 500,000 $yd^3$ of soil near significant archeological areas, Sacred Sites, and TCPs.

**Cumulative Activities Affecting Cultural Resources**

The Proposed Action could combine with the following cumulative activities which could impact cultural resources.

***ISRA***

The ISRA project focused on the remediation of soil on SSFL. ISRA requires removal of surface soil, which could impact archeological resources.

***GETS***

GETS involves digging wells, which could impact archeological resources.

***DOE ETEC Closure***

The DOE ETEC Closure includes soil remediation activities, as well as possible demolition of significant buildings and structures. The DOE ETEC soil remediation activities could impact archeological resources due to the ground-disturbing activities required to accomplish cleanup.

***Boeing Remediation Project***

The Boeing remediation project requires building demolition and the removal of large amounts of soil. Multiple archeological sites and isolates were discovered during recent studies in Area IV. Boeing's activities could impact archeological resources due to the ground-disturbing activities required to accomplish cleanup.

***Previous Test Stand Removal***

Test stands, ancillary facilities, and storage tanks have been removed from NASA-administered property over the course of many years. The removal of the Delta Test Stands and associated structures in the 1970s and the more recent demolition of Canyon and Bowl test facilities on Boeing property contribute to cumulative impacts to cultural resources at SSFL.

**Cumulative Impacts to Cultural Resources**

The Proposed Action would contribute to cumulative impacts on cultural resources. Cultural resources in SSFL have been and would continue to be impacted by previous and future activities, particularly ground-disturbing activities that could impact archeological deposits and demolition of structures. The cumulative impacts of NASA, DOE and Boeing's activities would have a ***significant, negative, regional,*** and ***long-term*** impact on cultural resources and the Indian Sacred Site and TCP.

#### 4.13.2.3 Biological Resources

The cumulative ROI for biological resources is the SSFL boundary. For the purpose of this EIS, biological resources include natural vegetation communities, wildlife, listed species, and wetlands. Overall iimpacts to biological resources would be ***significant, negative, regional,*** and ***long term,*** with the highest impacts on native vegetation communities, the potential spread of noxious weeds, and effects to sensitive species. However, due to the underlying contamination located on the site, the Proposed Action could also provide a ***moderate, beneficial, regional,*** and ***long-term*** impact to wildlife by removing this contamination, when compared to the No Action Alternative.

**Cumulative Activities Affecting Biological Resources**

The Proposed Action could combine with the cumulative activities described in the following text to result in cumulative impacts.

***ISRA***

The ISRA project also focused on the remediation of soil on SSFL. Although activities should be completed before initiation of the Proposed Action, it is likely that vegetation communities affected by the ISRA would not be rejuvenated fully before the proposed environmental cleanup is initiated. However, numerous BMPs have been implemented during the ISRA to mitigate the effects of the soil excavation activities (Boeing, 2011a). Additionally, excavation did not occur in sensitive vegetation communities, wetland areas, or known listed species habitat and USFWS has been consulted regarding impacts to sensitive species (MWH, 2011).

***GETS***

The GETS project focuses on remediating groundwater contamination in the SSFL boundary. The GETS footprint is nominal compared to the Proposed Action footprint and consists primarily of a series of groundwater extraction wells, flexible piping, and an isolated groundwater treatment unit located outside of sensitive vegetation communities, wetland areas, or known listed species habitat. As such, GETS has a minor impact to biological resources as related to the installation piping. Because the objective of GETS is to remove contamination from groundwater that could otherwise be ingested by wildlife or absorbed by vegetation, the remediation of groundwater contamination has a long-term benefit to biological resources within the ROI.

***DOE ETEC Closure***

The vegetation communities and wildlife species present in Area IV (the location of DOE ETEC site) are similar to those found in NASA Areas I and II, including large populations of Santa Susana tarplant and approximately 3 acres of Venturan coastal sage scrub habitat (SAIC, 2009). The exact location of the ETEC Closure boundaries are yet to be determined; however, DOE is working with DTSC to evaluate appropriate remediation alternatives and would consult with USFWS to minimize impacts to listed species and sensitive areas. Ground disturbance is anticipated to be similar in character to NASA's proposed remediation activities. The resulting effects on natural vegetation communities and sensitive species could be moderate to significant and negative**,** depending on the location, type, and extent of remedial technology implemented. It is assumed, however, that the DOE ETEC Closure would have a beneficial effect on biological resources in the long-term, due to the remediation of chemical and radioactive contamination.

***Boeing Remediation Project***

Because of the large area involved with the Boeing cleanup efforts, the impacts to natural communities and wildlife could be significant. Much of the Boeing-owned portion of Area I encompasses an important migration corridor, and sensitive plant and wildlife species have been identified in the Boeing administered areas (SAIC, 2009). In accordance with CEQA, the DTSC and Boeing would consult with CDFW and USFWS to minimize future impacts to listed species. The Boeing remediation project would have a long-term, beneficial effect on biological resources, due to the remediation of onsite contamination.

***Previous Test Stand Removal***

The previous NASA test stand removal occurred in developed areas and away from sensitive vegetation communities, wetlands, or listed species habitat. However, it is likely the test stands may have been used by migratory birds as nesting sites. Once the test stands and support facilities were removed, the area was brought back to grade and allowed to revegetate naturally, thereby increasing available vegetative habitat.

***Topanga Wildfire***

Most of the vegetation in the ROI burned and deposited significant ash throughout the area during the 2005 Topanga Wildfire. In areas with limited vegetation, such as rock outcrops, effects were minimal. However, naturally vegetated areas were substantially affected by burning and subsequent deposition of ash and burned debris. Plant sprouting has been relatively vigorous since the fire, and the more obvious visible effects have faded with time. An approved native seed mix was developed and planted throughout the area. However, perennial shrubs and live oak trees will require many years to regenerate to their former state and the maturity of the chaparral areas is much younger than before the fire. The 2005 Topanga Wildfire had a significant direct impact to vegetation communities on SSFL.

**Cumulative Impacts to Biological Resources**

The identified effects of the Proposed Action could combine with the previously mentioned activities to result in cumulative impacts. The collective indirect cumulative impacts to biological resources from the Proposed Action and the ISRA, GETS, DOE ETEC closure, and Boeing remediation projects would be ***moderate, beneficial, regional***, and ***long term,*** due to the reduction of contamination in the area. The combined impacts of the Proposed Action and the Boeing remediation project, the DOE ETEC closure, and the Topanga wildfire would remain ***significant, negative, regional,*** and ***long term***. Discussions with USFWS and CDFW would consider the individual project and cumulative activities and resulting effects to develop effective mitigation.

### 4.13.2.4 Traffic and Transportation

The cumulative ROI for traffic and transportation includes access routes to SSFL in both Los Angeles and Ventura counties. The Proposed Action would result in overall ***minor, negative, regional, and short-term*** impacts to roadway operations, truck traffic exposure on school children, safety effects from truck traffic, and pavement conditions.

**Cumulative Activities Effecting Traffic and Transportation**

The Proposed Action would combine with the Boeing and DOE activities to result in cumulative impacts, because the Boeing and DOE remediation projects would also result in increased passenger and truck traffic within the ROI. Combined daily truck traffic for the Boeing, DOE, and NASA projects is estimated to be 314 trucks per day through 2017 (Table 4.13-1), which would substantially increase average daily traffic and peak hour trips in the ROI.

TABLE 4.13-1
**Cumulative Truck Hauling Estimates of NASA, DOE, and Boeing Activities**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Parameter | NASA [a] | Boeing | DOE | Combined |
|---|---|---|---|---|
| Work Days per Week | 5 | 5 | 5 | 5 |
| Work Weeks per Year | 52 | 50 | 50 | 52 |
| Duration (days/year) | 260 | 250 | 250 | 250-260 |
| Truck Capacity ($yd^3$/truck) | 19 | 16 | 16 | N/A |
| Removal Volume ($yd^3$/year) | 247,585 | 200,000 | 850,00 | 1,050,000 |
| Annual Trucks (trucks/year) | 13,031 | 12,500 | 53,125 | 78,656 |
| Frequency (trucks per day) | 53 | 50 | 213 | 6 |

Notes:
N/A = not applicable

[a] Estimates based on NASA's Proposed Action to consider the most conservative potential cumulative effects.

### Cumulative Impacts to Traffic and Transportation

The adjacent DOE and Boeing cleanup activities would result in additional trucks on the local roadway networks in combination with SSFL project-related trips. All roadway segments considered in this analysis, except one, operate within the acceptable LOS with the estimated traffic increases from the Proposed Action and have capacity to accommodate an additional increase in traffic from the DOE and Boeing projects. Although southbound U.S. 101 currently exceeds the established V/C ratio threshold, a cumulative impact at this intersection would occur only if the cumulative added trips cause the roadway to degrade further.

The cumulative project trips might increase the potential for truck traffic exposure to school children if the additional increase in truck traffic occurs during school hours. There also might be an increase in the potential safety effects from the additional truck traffic. Some roadway degradation of Roscoe Boulevard, Valley Circle Boulevard, and Woolsey Canyon Road would be expected as a result of the three projects adding daily heavy truck traffic to these roadways. However, NASA, Boeing, and DOE will coordinate their efforts and the same mitigations measures would be in place for all three activities. The overall cumulative impacts from the Proposed Action and the Boeing and DOE activities would remain ***minor, negative, regional,*** and ***short term***.

## 4.13.2.5 Water Resources

The cumulative ROI for water resources includes SSFL and connected watersheds, specifically the Los Angeles River and Calleguas Creek Watersheds. For the purpose of this EIS, water resources include hydrology, surface water quality, and groundwater quality. The Proposed Action would result in ***negligible, negative, local,*** and ***long-term*** impacts to hydrology and surface water quality after the implementation of the prescribed BMP and in ***moderate, beneficial, local,*** and ***long-term*** impacts to groundwater quality after the implementation and successful completion of remediation activities, when compared to existing conditions.

### Cumulative Activities Affecting Water Resources

The Proposed Action could combine with the ongoing and reasonably foreseeable activities described in the following subsections to result in cumulative impacts.

***ISRA***

The ISRA project involves remediating soil contamination, which could affect water resources on SSFL. However, the ISRA project would be completed prior to the initiation of proposed activities and numerous water quality BMPs, including erosion control measures to minimize sedimentation, have been implemented at the sites, in accordance with the statewide General Permit for Stormwater Discharges Associated with Construction Activity (Order No. 2009-0009-DWQ [NPDES No. CAS000002]). These BMPs are consistent with the mitigation measures proposed in the project analysis (Boeing, 2011b).

***GETS***

The GETS project would also remediate groundwater contamination at SSFL. The objective of the GETS project is to improve groundwater quality within the ROI. Standard construction BMPs are being implemented during the well construction to minimize any impacts to hydrology and surface water quality.

***Boeing Remediation and DOE ETEC Closure Projects***

The Boeing and DOE projects also involve remediating soil and groundwater contamination. The activities at either of these sites also would be subject to the requirements of the statewide General Permit, and an SWPPP would be developed.

***Previous Test Stand Removal***

Efforts were made during the previous test stand removal efforts to maintain the natural hydrology of the area (MWH, 2007a) and the increase of natural pervious surface area would have a beneficial effect to surface and groundwater quality. The demolition activities also complied with the requirements of the General Permit.

***Topanga Wildfire***

The 2005 Topanga Wildfire generated large quantities of ash and debris, and exposed large areas of unvegetated soils, which negatively affected surface water quality within the ROI. Vast removal of vegetation affected natural hydrology in the region. However, Boeing and NASA worked with Los Angeles RWQCB to institute stormwater BMPs and subsequent regrowth allows little remaining evidence of the fire.

**Cumulative Impacts to Water Quality**

The Proposed Action could combine with these activities to result in cumulative impacts. The collective effects to groundwater quality from the Proposed Action and the ISRA, GETS, DOE ETEC closure, and Boeing remediation projects would be ***moderate, beneficial, local,*** and ***long term***, depending on the cleanup level achieved, due to the reduction of contamination in groundwater. The collective negative impacts to surface water and hydrology would remain ***negligible, negative, local,*** and ***short term***, because the referenced projects would comply with the requirements of the NPDES General Permit for Stormwater Discharges Associated with Construction Activity, including the SWPPP and ECP suggested BMPs, and that the impacts from the Topanga Wildfire are no longer evident.

### 4.13.2.6 Air Quality and Greenhouse Gas Emissions

The cumulative ROI for the air quality and GHG emissions includes the South Central Coast Air Basin, South Coast Air Basin, and San Joaquin Valley Air Basin. The Proposed Action would result *in* ***moderate, negative, regional,*** and ***short-term*** impacts to regional air quality and climate change, when compared to existing conditions after mitigation. The dust emissions from proposed demolition and operation activities would remain below the General Conformity *de minimis* threshold levels for the NAAQS criteria pollutants.

**Cumulative Activities Affecting Air Quality and Greenhouse Gas Emissions**

The Proposed Action could combine with the following ongoing and reasonably foreseeable activities to result in cumulative impacts.

***GETS***

The GETS project currently is operational and requires minimal construction activity or new emissions. Although operation of the GETS would emit GHGs and NAAQS criteria pollutants, the emissions are below the significance thresholds for the General Conformity Rule, GHG regulations, and fugitive dust.

***Boeing Remediation and DOE ETEC Closure Projects***

GHG and conformity analyses have yet to be completed on these projects. However, Table 4.13-1 provides estimates that have been developed regarding emission-generating activities for these projects. On the basis of these estimates, emissions resulting from the Boeing actions would be similar and DOE actions would be approximately 3.5 times those detailed in Section 4.7.

**Cumulative Impacts to Air Quality and Greenhouse Gas Emissions**

The Proposed Action could combine with the current and reasonably foreseeable actions to increase air pollution in the ROI. General Conformity is evaluated on a project-specific basis and not a cumulative basis. However, emissions from these activities could collectively contribute to significance thresholds for NAAQS criteria pollutants, GHG emissions, and fugitive dust. Although Boeing and DOE are expected to implement BMPs similar to those described in Section 4.7, the cumulative impacts to air quality, climate change, and fugitive dust would likely become ***significant, negative, regional, and short term***, because the General Conformity *de minimis* thresholds would likely exceeded in the SCAB, SJVAB, and Nevada air basins as a result of the significant material hauling activities performed by the three organizations.

### 4.13.2.7 Environmental Justice

The cumulative ROI for environmental justice and protection of children are the census tracts boundaries adjacent to the SSFL property and the primary access routes to SSFL (Figure 3.12-1). No disproportionate impacts are expected to minority or low-income populations from the Proposed Action. Consequently, there is no potential for cumulative impacts resulting from the combination of the Proposed Action and the other actions described previously. There is a potential ***moderate, negative, local,*** and ***short-term*** impact to child safety resulting from the increased truck traffic along proposed haul routes.

**Cumulative Activities Affecting Environmental Justice and Protection of Children**

The DOE and Boeing remediation projects would also increase truck traffic throughout the ROI near the schools shown in Figure 3.12-3. Children would be exposed to a noticeable increase in traffic and truck emission when crossing streets to get to school or a bus stop.

**Cumulative Impacts to Environmental Justice and Protection of Children**

The cumulative effect of these actions would still result in ***minor, negative, local,*** and ***short-term*** impacts to child safety. Development of a CTCP or reduced operation hours as part of each of these projects would help minimize safety hazards along these roadways.

### 4.13.2.8 Health and Safety

The cumulative ROI for health and safety is SSFL and the roadways accessing the NASA property. The Proposed Action would result in an overall ***negligible, negative, local,*** and ***short-term*** impact to health and safety hazards after the implementation of prescribed BMPs and mitigations and a ***minor, beneficial, local, and long-term*** impact from the reduction of onsite contamination.

**Cumulative Activities Affecting Health and Safety**

The Proposed Action could combine with the Boeing remediation or DOE ETEC closure project to result in cumulative impacts. The Boeing remediation and the DOE ETEC Closure projects also require workers to operate machinery and be exposed to contaminated materials. However, these projects would have similar health and safety plans to the Proposed Action, as regulated by the Occupational Safety and Health Act (29 CFR) and the California Occupational Safety and Health Administration (Cal/OSHA). These plans also would cover the potential for encountering underlying contamination.

**Cumulative Impacts to Health and Safety**

Through implementation of health and safety-related plans (site-specific HSPs, standard operation procedures, and Hazardous Substance Control and Emergency Response Plans), the potential cumulative impacts from health and safety hazards would remain ***negligible, negative, local,*** and ***short term***. However, there would be a ***minor, beneficial, local, and long-term*** impact from the reduction in onsite contamination resulting from the cumulative activities.

### 4.13.2.9 Site Infrastructure and Utilities

The cumulative ROI for site infrastructure is the boundary of SSFL. The Proposed Action would result in an overall ***minor, negative, local,*** and ***short-term*** impacts to existing buildings and utility infrastructure.

**Cumulative Activities Affecting Site Infrastructure and Utilities**

The cumulative activities affecting site infrastructure and utilities include the GETS operations. However, because utility infrastructure is generally sitewide and supplies services to the entire facility, there is a potential for cumulative impacts to utilities. During the NASA, DOE, and Boeing remediation activities, the rerouting of utilities would be coordinated as necessary prior to the implementation of remediation activities and other site work to eliminate prolonged loss of services.

**Cumulative Impacts to Site Infrastructure and Utilities**

Coordination with utility providers and locators, as discussed in ***Infrastructure Mitigation Measure-1*** and ***BMP-1,*** would be necessary for onsite cumulative activities. The cumulative effect of these activities is expected to remain ***minor, negative, local to regional,*** and ***short term***.

### 4.13.2.10 Noise

The cumulative ROI for noise includes local access routes to the entrance of SSFL, as well as within the boundary of SSFL. The Proposed Action would result in overall ***negligible, negative, local,*** and ***short-term*** noise impacts after the implementation of prescribed mitigations. The construction and demolition activities would occur at a great enough distance to be imperceptible to offsite receptors and the increased traffic noise would be barely perceptible and limited to daytime periods.

**Cumulative Activities Affecting Noise**

The Boeing and DOE remediation projects would also result in increased construction, demolition, and traffic noise. The increased noise levels from these actions are expected to be similar to the Proposed Action.

**Cumulative Impacts to Noise**

The cumulative noise impacts resulting from the Proposed Action and the Boeing and DOE activities could result in an increased annoyance to the local community, if the actions occur concurrently. If the actions are performed concurrently, they would only occur during daylight hours and the overlap would be limited; therefore, the cumulative impacts are expected to be ***minor, negative, regional,*** and ***short term***.

### 4.13.2.11 Hazardous and Nonhazardous Materials and Waste

The cumulative ROI for hazardous and nonhazardous materials and waste is defined as SSFL and the routes to the offsite disposal facilities. The Proposed Action would result in overall ***minor, negative, regional,*** and ***long-term*** impacts resulting from the increase of solid and hazardous waste generated from the demolition and remediation activities.

**Cumulative Activities Affecting Hazardous and Nonhazardous Materials and Waste**

The Proposed Action could combine with the following ongoing and reasonably foreseeable activities to result in cumulative impacts.

***ISRA***

The ISRA project involves remediating contaminated soil and transporting the soil offsite. The ISRA project reduces the level of soil contamination in the project area, reduces the potential for stormwater migration of contaminants, and lessens the hazardous material exposure risk in the ROI.

The ISRA project would be completed prior to the initiation of the Proposed Action; therefore, hazardous waste generation resulting from the ISRA project should be remediated prior to the Proposed Action and would not result in a cumulative impact.

***GETS***

The GETS is an ongoing groundwater cleanup action which would occur in conjunction with the Proposed Action. The GETS project has contained contamination on the site thereby avoiding offsite migration and reducing impacts from hazardous materials. Its objective is to reduce the level of contamination in the project area and thus reduce the hazardous material exposure risk. However, the GETS would also result in the use of hazardous materials, such as fuels, oils, and lubricants.

***Boeing Remediation and DOE ETEC Closure Projects***

The Boeing remediation and DOE ETEC closure projects would also generate hazardous waste and increase the potential for an accidental hazardous material release. The estimated cubic yards of excavated material needing to be disposed in regional landfills is shown in Table 4.13-1.

***Topanga Wildfire***

Fires produce toxic chemicals from the burning of vegetation, fabricated materials, and waste. Contaminants released onsite from the 2005 Topanga wildfire were limited to those typically created by burning brush, building materials, kerosene, machine oils, and lubricants. Untreated groundwater containing trace quantities of trichloroethene (TCE) may have been released and likely evaporated (Boeing, 2005). The lasting effect to hazardous materials from the Topanga Fire would be increased levels of dioxin and metals within the ROI.

**Cumulative Impacts to Hazardous Materials and Waste**

The Proposed Action could combine with these activities to result in cumulative impacts. The combined effects of the Proposed Action with the ISRA, GETS, DOE ETEC closure, and Boeing remediation would result in a ***moderate, negative local,*** and ***short-term*** impact to hazardous waste generation. Regional landfill capacity as shown in Table 2.2-5 would be sufficient to handle the cumulative waste generation from the aforementioned activities.

## 4.13.3 Summary of Cumulative Impacts

Table 4.13-2 provides a summary of impact findings from both the project analysis presented in Sections 4.2 through 4.12 and the cumulative impact analysis provided in Section 4.13.2. Cumulative activities introduced in Section 4.13.1 that might affect that resource or contribute to the overall cumulative effect are identified.

TABLE 4.13-2
**Summary of Cumulative Impacts**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Resource Area | Overall Project Impacts[a] | Contributing Cumulative Activities | Cumulative Impacts |
|---|---|---|---|
| Section 4.2: Soils, Landslide Potential, Topography, and Paleontological Resources | Minor, negative, local, long term<br>◯ | • ISRA<br>• DOE ETEC closure<br>• Boeing remediation project<br>• Previous test stand removal | Minor, negative, local, long term<br>◯ |
| Section 4.3–Cultural Resources | Significant, negative, regional, long term<br>*Adverse effect under Section 106*<br>● | • ISRA<br>• GETS<br>• DOE ETEC closure<br>• Boeing remediation project<br>• Previous test stand removal | Significant, negative, regional, long term<br>*Adverse effect under Section 106*[b]<br>● |
| Section 4.4–Biological Resources | Significant, negative, regional, long term<br>● | • ISRA<br>• GETS<br>• DOE ETEC closure<br>• Boeing remediation project<br>• Previous test stand removal<br>• Topanga wildfire | Significant, negative, regional, long term<br>● |
| | Minor, beneficial, regional, long term<br>▣ | | Moderate, beneficial, regional, long term<br>▣ |
| Section 4.5: Traffic and Transportation | Minor, negative, regional, short term<br>◯ | • DOE ETEC closure<br>• Boeing remediation project | Minor, negative, regional, long term<br>◯ |
| Section 4.6–Water Resources | Negligible, negative, local, long term<br>○ | • ISRA<br>• GETS<br>• DOE ETEC closure<br>• Boeing remediation project<br>• Previous test stand removal<br>• Topanga wildfire | Negligible, negative, local, short term<br>○ |
| | Moderate, beneficial, local, long term<br>▣ | | Moderate, beneficial, local, long term<br>▣ |
| Section 4.7–Air Quality and Greenhouse Gas Emissions | Moderate, negative, regional, short term<br>◉ | • GETS<br>• DOE ETEC closure<br>• Boeing remediation project | Significant, negative, regional, short term<br>● |
| Section 4.8–Environmental Justice | Negligible, negative, local, short term<br>○ | • DOE ETEC closure project<br>• Boeing remediation project | Minor, negative, local, short term<br>◯ |

TABLE 4.13-2
**Summary of Cumulative Impacts**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| Resource Area | Overall Project Impacts[a] | Contributing Cumulative Activities | Cumulative Impacts |
|---|---|---|---|
| Section 4.9–Health and Safety | Negligible, negative, local, long term<br>○ | • DOE ETEC closure project<br>• Boeing remediation project | Negligible, negative, local, short term<br>○ |
| | Minor, beneficial, local, long term<br>◘ | | Minor, beneficial, local, long term<br>◘ |
| Section 4.10–Site Infrastructure and Utilities | Minor, negative, local, short term<br>⭘ | • DOE ETEC closure<br>• Boeing remediation project | Minor, negative, local and regional, short term<br>⭘ |
| Section 4.11–Noise | Negligible, negative, local, short term<br>○ | • DOE ETEC closure<br>• Boeing remediation project | Minor, negative, regional, short term<br>⭘ |
| Section 4.12–Hazardous and Nonhazardous Materials and Waste | Minor, negative, regional, short term<br>⭘ | • ISRA<br>• GETS<br>• DOE ETEC closure<br>• Boeing remediation project<br>• Topanga wildfire | Moderate, negative, local, short term<br>◉ |

Notes:
● or ■ = Significant
◉ or ▣ = Moderate
⭘ or ◘ = Minor
○ or □ = Negligible
Circular symbols represent negative impacts while square symbols represent beneficial impacts, and the degree to which the symbol is filled represents the severity of the impact.

[a] Overall impacts assumes BMPs and mitigation measures will be implemented for negative impacts.
[b] Pending consultation.

# 4.14 Other Required Analyses

Per NEPA and NASA Procedural Requirements Section 8580.1 (NASA, 2008a), this section discusses the two mandatory subsections of NEPA analysis:

- **The Relationship Between Short-Term Use of the Human Environment and the Maintenance and Enhancement of Long-Term Productivity**, which addresses possible conflicts with the objectives of federal, state, Tribal, and local land use plans and policies or private party plans for the affected area
- **Irreversible and Irretrievable Commitments of Resources,** which addresses the use of nonrenewable energy resources, natural and depletable resources, and scarce materials and the conservation potential of the action under evaluation, including associated mitigation measures

This section further discusses Incomplete and Unavailable Information, which involves information pertinent to the analysis of specific environmental issues that is not available or has not yet evolved to a stage where it can be used.

## 4.14.1 Relationship between Local Short-term Use of the Environment and Long-term Productivity

NEPA requires an analysis of the relationship between a project's short-term impacts on the environment and the effects of those impacts on the maintenance and enhancement of the long-term productivity of the environment. Impacts that limit future uses of the site are of particular concern. In other words, this analysis considers whether one project alternative limits the flexibility of future reuse of the NASA-administered property, as compared to another action alternative. This analysis also considers whether a project alternative might commit a resource to a certain use, thereby eliminating the possibility for other uses of that resource.

Short term refers to the total duration of demolition and soil cleanup activities until the property is recognized as suitable for transfer, while long term refers to an indefinite period beyond property transfer. The timeframe for meeting the prescribed Look-Up Table values under the Proposed Action is to comply with the 2010 AOC, with completion planned by 2017, and is considered short-term.

The Proposed Action would result in both short- and long-term impacts. Although the Proposed Action would prepare the site for future reuse, long-term impacts reduce environmental productivity, such as a reduction in native vegetation—including species of concerns to Native Americans and significant impacts to the Indian Sacred Site and TCP. The beneficial long-term impact is the overall reduction of contaminants across the ROI and reducing exposure risk to wildlife and humans.

Demolition activities (i.e., short-term use) could include removal of historically valuable structures that either are individually eligible for NRHP listing or contribute to an NRHP listing forever (i.e., long-term productivity). Likewise, proposed demolition and excavation activities might remove archeologically important features from future long-term productivity. These historic and archeological removals would be long-term (permanent). As discussed in Sections 4.3 and 5, NASA has been consulting with the SHPO and ACHP in developing mitigation measures to address these impacts.

The Proposed Action is not in conflict with federal, state, or local land use plans. Future land uses might conflict with these plans; however, such uses would not be a direct result of the Proposed Action.

## 4.14.2 Maintenance and Enhancement of Irreversible and Irretrievable Commitments of Resources

NEPA and NPR 8580.1 (NASA, 2008a) require that a lead agency analyze the extent to which the proposed and alternative actions could commit non-renewable resources to uses that would be irreversible or irretrievable to future generations. A commitment would be irreversible when an impact limits the future options for a resource. An irretrievable commitment refers to the consumption of resources that are neither renewable nor recoverable for future use.

Construction and operation of the various soil and groundwater remedial technologies would consume energy and a small quantity of building materials, such as well casings and staging pavement or containment material.

Petroleum, oils, and fuels would be used by construction and demolition equipment, transport vehicles, and crew vehicles. SVE (soil remediation), ex situ treatment using thermal desorption (soil remediation), pump-and-treat (groundwater remediation), vacuum extraction (groundwater remediation), and heat-driven extraction (groundwater remediation) would consume energy. Water also would be needed for dust suppression and to operate certain drilling and remediation equipment. Much of the concrete and building materials recovered from demolition would be disposed as nonhazardous waste because certain materials–such as concrete, steel, soils, or water–tested to be uncontaminated could be reclaimed, recycled, and/or reused.

Paleontological resources might be encountered during deeper earthwork. Likewise, archeological resources and historic resources have been documented on the NASA-administered property at SSFL. These are analyzed in Sections 4.2 and 4.3 of this EIS, respectively. These resources are considered non-renewable and, if affected, the impact essentially would be irreversible. NASA is consulting with SHPO, ACHP, tribes, and consulting parties to develop appropriate mitigation measures for addressing the impacts to cultural resources. Consultation will culminate with measures to address the adverse effects to historic properties stipulated in the ROD.

Trade and non-skilled laborers would be used during demolition and certain soil and groundwater remediation technologies, if implemented. Labor generally is not considered to be a resource in short supply and NASA's Proposed Action would not have a negative impact on the continued availability of these resources.

### 4.14.3 Incomplete and Unavailable Information

NEPA requires that "when an agency is evaluating reasonably foreseeable significant adverse effects on the human environment in an EIS and there is incomplete or unavailable information, the agency shall always make clear that such information is lacking" (40 CFR 1502.22). The purpose of this section of a NEPA analysis is to communicate the uncertainty within an analysis and to justify how NASA has reasonably dealt with that uncertainty to analyze the potential effects of the Proposed Action sufficiently.

NASA acknowledges that studies are ongoing to evaluate specifically where soil treatment is needed to meet the alternative cleanup goals and the effectiveness of each of the soil remediation technologies (and groundwater treatment technologies). DTSC is developing a Look-Up Table, in coordination with EPA, NASA, and DOE. This table will pertain to the Proposed Action and will be developed on the basis of local background soil concentrations and minimum detection limits for specific contaminants whose minimum detection limits exceed local background concentrations. The results of the sampling efforts would be compared to the values in the Look-Up Table in order to identify the locations and extent of soil environmental cleanup activities throughout SSFL.

Because this specific information is not yet available and the timeline for completing cleanup activities, as specified in the 2010 AOC, is imminent, NASA has taken a comprehensive and conservative approach to evaluate the Proposed Action, including considering the demolition of up to all structures on the site, and to provide a comparative analysis among remediation technologies to achieve the Look-Up Table values. The analysis assumes that the technologies are feasible and effective and focuses on the potential environmental effects. This approach allows for a comprehensive comparison of effects between project components within and among each alternative to identify where impacts occur and where avoidance or mitigation measures might be appropriate.

If other NASA studies or the DTSC Look-Up Table values identify new or better data that conflict with the analysis or findings of the EIS in a way that identifies an increase in potential effects to one or more resource areas, the analysis would either be updated or supplemented.

## 4.15 Required Permits, Licenses, and Approvals

The following permits, licenses, and approvals likely would be required for the Proposed Action. The agency responsible for each is noted after the identified permit, license, or required consultation. Required permits, licenses, or approvals would be obtained prior to implementation of the proposed demolition or environmental cleanup activities:

- CWA Section 404 Dredge and Fill Permit, USACE
- CWA Section 401

- Quality Certification, RWQCB
- California General Permit for Stormwater Discharges Associated with Construction Activity, SWRCB
- NPDES Permit–Los Angeles RWQCB
- Biological Opinion, USFWS
- Endangered Species Act Section 7 Consultation with USFWS (Section 5 contains a discussion of this process)
- Section 106 Consultation, California SHPO, ACHP, NASA (Section 5 provides a discussion of this process)

The following specific permits, licenses, and approvals might be required if specific soil or groundwater cleanup approaches were selected:

- VOC/SVOC Emissions Permit, VCAPCD-required if either of the following soil cleanup technologies were implemented:
  - SVE
  - Ex situ treatment using thermal desorption
- Hazardous Materials Storage Permit, Ventura County Resource Management Agency, Environmental Health Division (Certified Unified Program Agency)–required if there were onsite storage of hazardous materials in excess of 55 gallons, 500 pounds, 200 cubic feet, or Emergency Planning and Community Right-to-Know Act capacity thresholds specified in SARA Section 311
- Class V Injection Permit, EPA Region 9–required if one or more of the following soil cleanup technologies were implemented:
  - In situ chemical oxidation
  - In situ anaerobic or aerobic biological treatment
- Class V Injection Permit, EPA Region 9–required if one or more of the following groundwater cleanup technologies should be implemented:
  - In situ chemical oxidation
  - In situ enhanced bioremediation
- Air Permit, VCAPCD–required if one or more of the following groundwater cleanup technologies should be implemented:
  - Vacuum extraction
  - Heat-driven extraction

SECTION 5

# Agencies, Organizations, and Individuals Consulted

## 5.1 Introduction

Pursuant to the National Environmental Policy Act (NEPA) and to NASA Procedural Requirement 8580.1 (NASA, 2008a), federal and state agencies, Native American Tribes, other organizations, and members of the public were consulted during NASA's environmental review process for the proposed demolition and environmental cleanup activities at SSFL. This section provides a summary of NASA's public outreach and consultation efforts.

Public and agency involvement included informational materials and fact sheets, informational and scoping meetings, meetings with agency representatives, presentations and briefings, and notification and circulation of the EIS. In addition, NASA posted meeting notices, materials, and public documents on its website at http://ssfl.msfc.nasa.gov.

## 5.2 Scoping and Draft EIS Process

The Notice of Intent (NOI) initiated a public comment-scoping period that began on July 8 and ended on September 19, 2011. During that period, NASA hosted the following series of public scoping meetings:

- August 16, 2011: Chatsworth Hotel, 9777 Topanga Canyon Road, Chatsworth, CA 91311
- August 17, 2011: Grand Vista, 999 Enchanted Way, Simi Valley, CA 93065
- August 18, 2011: Corporate Pointe at West Hills, 8413 Fallbrook Ave, West Hills, CA 91304

Approximately 110 verbal comments (total of 55 oral submittals) were transcribed by a court reporter. Approximately 231 submittals from agencies, organizations, and individuals were received by e-mail, U.S. Post Office, or hand delivery at the meetings. Because many submittals contained multiple comments in each submittal, a total of about 756 individual comments were identified. Appendix K contains a summary of these comment letters and transcripts, along with a breakdown of the types of comments, the numbers of each type of comment, and the general responses to these comments.

The Notice of Availability (NOA) initiated a public comment period for the Draft EIS (DEIS) that began on August 2, 2013, and ended on September 16, 2013. In response to requests by several members of the public, NASA extended the public comment period for an additional 15 days to October 1, 2013. During the public comment period, NASA hosted two public meetings:

- August 27, 2013: Corporate Pointe at West Hills, 8413 Fallbrook Ave, West Hills, CA 91304
- August 28, 2013: Corporate Pointe at West Hills, 8413 Fallbrook Ave, West Hills, CA 91304

Comments and responses on the DEIS are included in Appendix K. All comments on the DEIS, including those provided at public meetings, letters, and e-mails, are available at http://foia.msfc.nasa.gov/docs/SSFL/index.html.

## 5.3 Public Outreach

During scoping and preparation of the DEIS, NASA provided project updates pertaining to the EIS in the following ways:

- Published the NOI in the Federal Register on July 6, 2011.
- Published an article in the NASA FieldNOTES newsletter in April 2011, distributed to more than 60,000 local residences and other interested parties. The newsletter article discussed the kickoff of the NEPA process.
- Distributed by e-mail on July 6, 2011, a notice to more than 600 e-mail addresses on the SSFL Program distribution list announcing the public scoping meetings. Published newspaper advertisements on August 5, 2011, in English in the *Ventura County Star*, the *Los Angeles Daily News*, and the *Simi Valley Acorn*, and in Spanish (August 7, 2011) in *La Opinion*. Provided an update to NASA's EIS environmental review, consultation

process, and other SSFL activities in the *2011 Year In Review* (NASA, not dated [n.d.]), which was distributed at public meetings, to attendees of tours, and to the NASA SSFL e-list and, on February 1, 2012, posted on the SSFL website.

- Tweeted notice July 8, 2011, by NASA's Environmental Communications (http://twitter.com/nasaenvcomm) announcing NASA Public "Scoping" Meetings for EIS at SSFL.
- Tweeted notice February 8, 2012, by NASA's Environmental Communications Twitter page (http://twitter.com/nasaenvcomm) announcing the March 27, 2012, Informational Community Meeting to provide updates to the public regarding NEPA preparations at SSFL.
- Established and posted public notices and other project updates pertaining to the NEPA and Section 106 planning processes posted on the project Web site: http://ssfl.msfc.nasa.gov/. (Established September 30, 2011; updates provided through present.)
- Hosted an informational meeting on March 27, 2012, in Chatsworth, California, to provide project updates during the project planning process. Public was notified of the meeting date via e-mail on January 11, 2012. The meeting date and information was posted to NASA's website on February 7 and Twitter on February 8, 2012. Reminders were e-mailed to the SSFL Program distribution list on February 15 and March 15, 2012.
- Provided notice for the March 27, 2012, Community Informational Meeting regarding the EIS by mail, the week of March 15, 2012, to residents on Woolsey Canyon due to noted lack of Internet access.

NASA provided project updates and notifications pertaining to the publication and public review period for the DEIS in the following ways:

- Posted the DEIS on NASA's website for public review on August 2, 2013.
- Posted the NOA in the Federal Register on August 2, 2013.
- Distributed a notice via e-mail on August 2, 2013, to more than 600 e-mail addresses on the SSFL program distribution list announcing the NOA of the DEIS in the Federal Register.
- Published newspaper advertisements on August 22, 2013, in English in the *Ventura County Star*, the *Los Angeles Daily News*, and the *Simi Valley Acorn*, and in Spanish in *La Opinion*.
- Provided an update to NASA's EIS environmental review, consultation process, and other SSFL activities in the 2012 *Year In Review* and the *2013 Year In Review* (NASA, not dated [n.d.]), which were distributed at public meetings, to attendees of tours, and to the NASA SSFL e-list, and also posted on the SSFL website.
- Tweeted notice August 5, 2013, by NASA's Environmental Communications Twitter page (http://twitter.com/nasaenvcomm) announcing availability of the DEIS.
- Tweeted notice August 20, 2013, by NASA's Environmental Communications Twitter page (http://twitter.com/nasaenvcomm) informing the public of the 15-day extended review period.
- Distributed an e-mail notice on August 20, 2103, to more than 600 e-mail addresses on the SSFL program distribution list. The e-mail informed the public of the 15-day extended review period.
- Posted on NASA's website on August 20, 2013, a notice of the 15-day extended review period.
- Hosted public meetings on August 27 and 28, 2013, to present the DEIS and provide the public an opportunity to comment on the DEIS. All verbal comments were captured in meeting transcripts.
- Published notice in the Federal Register on September 11, 2013, advising the public that the coment period would be extended by 15 days to October 1, 2013.
- *Ventura County Star* carried an article on August 3, 2013, that noted availability of the DEIS for public comment, notice of the August 2013 public meetings, and how to submit comments on the DEIS.

Northridge Patch published an article, "Draft Impact Plan Released for Santa Susana Field Lab Cleanup," on August 12, 2013. NASA circulated the DEIS for review in the following ways:

- Posted the DEIS on NASA's website on August 2, 2013, at http://www.nasa.gov/agency/nepa/news/SSFL.html or public review.
- Provided hard copies to the following repositories:
  - Simi Valley Library, 2969 Tapo Canyon Road, Simi Valley, California
  - Platt Library, 23600 Victory Boulevard., Woodland Hills, California
  - California State University, Northridge Oviatt Library, 18111 Nordoff Street, 2nd Floor Room 265, Northridge, California
  - Department of Toxic Substances Control, 9211 Oakdale Avenue, Chatsworth, California
- Distributed a limited number of hard copies of the DEIS to elected officials; federal, state, and local agencies; tribes; organizations andcompanies, and individuals who requested them.
- Provided CD copies to any individual who requested it, and distributed CDs to the CAG members and attendees at a CAG meeting held on August 14, 2013.

Web postings complied with Section 508 of the Federal Rehabilitation Act to make the information accessible and available to people with disabilities.

# 5.4 Consultation Process

## 5.4.1 National Historic Preservation Act Section 106 Consultation

Pursuant to 36 *Code of Federal Regulations* (CFR) Section 800.8(c) of the National Historic Preservation Act (NHPA), NASA is using this EIS to comply with Section 106 of the NHPA in lieu of the procedures set forth in Sections 800.3 through 800.6. This EIS and its planning process incorporate the necessary consideration and consultation outlined in the NHPA.

In Section 106 of the NHPA consultation is defined as the process of seeking, discussing, and considering the views of others and seeking agreement with them regarding the eligibility and effects findings presented. It requires that the lead agency involve consulting parties in its findings and determinations, and that the lead agency plan the consultations so they are appropriate to the scale of the undertaking. Also, 36 CFR 800 requires that the agency official seek and consider the views of the public, provide the public with information about the undertaking and its effects on historic properties, and seek public comment. The regulations permit the agency to use the public involvement procedures under NEPA to fulfill this requirement.

NASA initiated consultation with the State Historic Preservation Officer (SHPO) and the Advisory Council on Historic Preservation (ACHP) in June 2011 identifying that NASA would be using NEPA in lieu of Section 106 in accordance with 36 CFR 800.8(c). The SHPO and ACHP responded, confirming that they each would participate in the consultation process. More than 35 individuals have been involved during the consultation, with additional parties having joined as recently as November 2013. Consulting parties have varying interests in the site and include representatives from the Santa Ynez Band of Chumash Indians, a federally recognized tribe; and members of state-recognized tribes. Consulting parties have met onsite at SSFL and via teleconference to discuss the potential impacts to historic properties such as the Burro Flats Cave and the historic test stand districts. Consultation will culminate with measures to address the adverse effects to historic properties stipulated in the ROD and possibly a Programmatic Agreement, which completes the EIS process and will complete the Section 106 process. The ROD is the formal document that states NASA's decision; identifies the alternatives considered; and discusses mitigation plans, commitments by the agency, and monitoring. Appendix C to this EIS provides a detailed summary of the Section 106 consultation process.

#### 5.4.1.1 Tribal Consultation

The NHPA requires consultation with Native Americans who have religious and cultural attachments to properties. NASA contacted the Native American Heritage Commission (NAHC) in June 2011 to request a list of recognized tribes in the SSFL area. The NAHC responded with a list of Native Americans who are culturally affiliated with the SSFL area. Each of the individuals or groups was contacted by letter in June 2011. The Santa Ynez Band of Chumash Indians responded in July 2012 that it would like to participate in the Section 106 process and formally responded in September 2012. The other tribes and individuals on the NAHC list initially did not respond to the letter or request to be consulting parties, but some later participated in onsite meetings. NASA followed up with the other tribes and individuals on the NAHC list upon public release of the EIS, and several tribal members were contacted as a part of the TCP and Cultural Landscape Assessment. The assessment includes an investigation and evaluation of the existence and extent of a TCP, in part through interviews with local archeologists, ethnographers, and state and federal tribal members.

In December 2012, NASA received notice from the Santa Ynez Band of Chumash Indians of the tribe's designation of the NASA portion of SSFL as an Indian Sacred Site (Santa Ynez Band of Chumash Indians, 2012). There currently are no specified boundaries of the sacred site and once the boundaries are identified, they will remain confidential to protect the sacred nature of the site. Consultation with the Santa Ynez Band of Chumash Indians is ongoing regarding the Proposed Action and the impacts to the designated Indian Sacred Site.

#### 5.4.1.2 Consulting Parties

An application process was put in place for individuals or groups who wanted to become consulting parties and participate in the Section 106 consultation process. These consulting parties represent themselves and in some cases, their organizations, which include the Santa Susana Mountain Park Association, Aerospace Contamination Museum of Education, Native American Monitoring Group, Ventura County Cultural Heritage Board, Simi Valley Historical Society, Compass Rose Archaeological, San Fernando Valley Audubon Society, Tongva Ancestral Territorial Tribal Nation, Resource Conservation District of Santa Monica Mountains, Ventura County Archaeological Society, cleanuprocketdyne.org, enviroreporter.com, and Save Open Space, as well as the SHPO and ACHP. Representatives of the U.S. General Services Administration, National Park Service, SHPO, and ACHP also are participating in the Section 106 consultation. There were 35 individuals listed as Section 106 consulting parties as of December 31, 2013.

#### 5.4.1.3 Consultation Process

NASA has met with SHPO, ACHP, and Section 106 consulting parties at strategic points of the EIS planning process to review project data; to discuss the area of potential effect (APE); to identify historic properties; and to discuss measures to mitigate adverse effects on cultural, historic, archeological, and Native American resources that could result from the Proposed Action.

A total of eight consulting party meetings have been held, with the first one on March 1, 2012, at SSFL. It included a tour of the historic properties. The last meeting was held at SSFL on February 13, 2014. NASA has met with or communicated with the SHPO, ACHP, and Section 106 consulting parties at strategic points of the EIS planning process to review project data; discuss the APE; identify historic properties; identify effects on historic properties; and discuss measures to mitigate adverse effects on cultural, historic, archaeological, and Native American resources that could result from the Proposed Action. As part of this process, there have been additional electronic communications regarding the proposed APE for comment (in May 2012); the final APE (October 2012); dispersal of meeting notes for comment; and consulting party comments on meetings, announcements, or issues raised at meetings. Throughout this process, NASA accepted comments on the DEIS, items discussed at meetings, proposed mitigation measures, and the process itself. NASA sent the consulting parties the draft agreement document on December 19, 2013, for their review and comment. The consulting parties were given until January 17, 2014, to return comments to NASA on the agreement document and on the mitigation measures stipulated in the document to address the adverse effect on historic properties. NASA weighed the diverse opinions and disparate views expressed during the consultation process to identify ways to minimize or avoid adverse effects to historic properties. Not all adverse effects could be avoided, and many consulting parties were disappointed that not all of the historic test stands were likely to be saved.

The agreement document formalizing the agreement among the parties regarding appropriate mitigation measures to address the adverse effect on cultural resources will be a part of the ROD. If the agreement document is signed and executed prior to completion of the Final EIS (FEIS), it will be attached to this report and to the FEIS. If the agreement document is not executed prior to completion of the FEIS, it will be included in the ROD. The executed agreement document will close the Section 106 process for this undertaking.

### 5.4.2 Endangered Species Act Section 7 Consultation

NASA sent letters to the U.S. Fish and Wildlife Service (USFWS), the California Department of Fish and Wildlife (CDFW), and the U.S. Army Corps of Engineers (USACE) on August 12, 2011, providing a brief introduction of the project, including a summary of biological issues at the site and initiating informal consultation under Section 7 of the Endangered Species Act. On December 21, 2011, NASA sent USFWS a letter requesting a species list pertaining to the NASA-administered property at SSFL. USFWS responded on January 6, 2012, initiating the formal consultation process. NASA submitted a Wetland Delineation and Request for a Jurisdictional Determination to USACE on April 11, 2012. On February 12, 2013, USACE responded to NASA with an approved Jurisdictional Determination (Appendix G). NASA sent a Biological Assessment to USFWS on July 11, 2013, with a revision on November 6, 2013. On December 13, 2013, the USFWS issued a letter of concurrence with NASA's determination that the project may affect, but is not likely to adversely affect federally threatened and endangered species. A copy of the Wetland Delineation and associated letters are included in Appendix G. Copies of other correspondence with USFWS and USACE letters are included in Appendix L. The Biological Assessment and related correspondence with USFWS are included in Appendix M. The meetings are summarized in the following text.

***December 1, 2011–***A coordination meeting among NASA, USFWS, and CDFW (then called California Department of Fish and Game) was held to introduce the SSFL EIS and to develop a dialogue and plan for successfully completing Section 7 activities associated with NASA's EIS. Past biological surveys, including habitat and wildlife surveys and protocol-level rare plant surveys, were discussed. The initial schedule for the biological assessment and timeline for Section 7 consultation with USFWS were discussed. Appendix L includes a meeting summary.

***April 25, 2012–***A consultation teleconference and webinar between NASA and USFWS was held to discuss the status of biological surveys and studies and the development of the biological assessment. Appendix L provides a meeting summary.

***February 14, 2013***–A consultation teleconference and webinar between NASA and USFWS was held on February 14, 2013, to discuss the status of biological surveys and studies and the conclusions about potential effects on listed species. The agreements on these issues have been incorporated into the EIS and the biological assessment.

### 5.4.3 Other Agency Coordination

***July 12, 2011–***NASA's Allen Elliott (SSFL Program Director) had a teleconference with Debbie Raphael (Department of Toxic Substances Control [DTSC] Director), Odette Madriago (DTSC Deputy Director), Nancy Bothwell (DTSC Legal Representation), Rick Brausch (DTSC SSFL Project Director), and Mark Malinowski (DTSC SSFL Delivery Manager). The focus of the meeting was to discuss NASA's NOI for the SSFL EIS, the alternatives considered in NASA's EIS, and the NASA-DTSC plan for coordination.

***August, 25, 2011–***NASA (Merrilee Fellows and Peter Zorba), The Boeing Company (Boeing), and the U.S. Department of Energy (DOE) met with Debbie Raphael (DTSC Director), Stewart Black (DTSC Deputy Director–Environmental Restoration), and Rick Brausch (DTSC Deputy Director–Policy). Director Raphael was introduced to the SSFL team and given a tour of SSFL. Discussion focused on the SSFL background, former operations, and current investigations, as well as on the Regional Water Quality Control Board (RWQCB) interim source removal actions, and stormwater and National Pollutant Discharge Elimination System best management practices implementation. The site visit concluded with Director Raphael describing her understanding of the SSFL cleanup; the two Administrative Orders on Consent (AOCs) with both NASA and DOE; and her planned approach, foreseen challenges, and ultimate goals.

***August 31, 2011–***NASA's Allen Elliott (SSFL Program Director) and Peter Zorba (SSFL Remedial Project Manager) had a teleconference with Debbie Raphael (DTSC Director), Stewart Black (DTSC Deputy Director for Brownfields and Environmental Restoration), and Rick Brausch (DTSC SSFL Project Director). The DTSC Director summarized a conversation she had with the California Environmental Protection Agency (Cal/EPA) secretary, Matt Rodriquez, regarding NASA's EIS. Director Raphael acknowledged NASA's requirement to conduct a NEPA evaluation and her preference for coordination. The conversation focused on strategic ideas regarding how NASA and DTSC would coordinate their respective NEPA and California Environmental Quality Act (CEQA) activities.

***October 21, 2011–***NASA's Dr. Jim Wright (Deputy Assistant Administrator, Mission Support Directorate), Mark Batkin (NASA General Counsel), and Allen Elliott (SSFL Program Director) had a teleconference with Grant Cope (Senator Boxer's staff). NASA briefed Mr. Cope about its NEPA approach. Mr. Cope understood the scope of NASA's EIS and NASA's commitment to implementing the 2010 AOC (State of California DTSC Docket No. HAS-CO_10/11-038, 2010).

***October 27, 2011–***NASA's Dr. Jim Wright (NASA Deputy Assistant Administrator Mission Support Directorate), Mark Batkin (NASA General Counsel), Peter Zorba (NASA SSFL Remedial Project Manager), and Allen Elliott (NASA SSFL Program Director) met with Matt Rodriguez (Cal/EPA Secretary), Debbie Raphael (DTSC Director), Stewart Black (Brownfields and Environmental Restoration Deputy Director), Rick Brausch (SSFL Project Director), and others. The objective of this meeting with the Cal/EPA Secretary and DTSC leadership was to discuss and collaborate about future NASA SSFL NEPA activities. The conversation focused on NASA's commitment to implementing the 2010 AOC, an overview of the NASA EIS process and progress, and strategic NASA-DTSC coordination during the parallel NEPA-CEQA processes.

***December 1, 2011–***As noted previously, as part of the initiation for Section 7 consultation, NASA coordinated with both USFWS and CDFW. The objectives of the meeting were discussed previously; Appendix L provides a meeting summary.

***February 7, 2012–***NASA's Dr. Jim Wright (NASA Deputy Assistant Administrator, Mission Support Directorate), Mark Batkin (NASA General Counsel), Peter Zorba (NASA SSFL Remedial Project Manager), and Allen Elliott (NASA SSFL Program Director) had a teleconference with Debbie Raphael (DTSC Director), Stewart Black, Rick Brausch, Nancy Bothwell, and Miriam Barcellona Ingenito (representative to Cal/EPA Secretary). NASA provided DTSC with an update regarding the project status and the current progress of NASA's NEPA process. DTSC Director Raphael confirmed that NASA and DTSC were communicating to the greatest extent possible. NASA confirmed its commitment to implementing the 2010 AOC. Strategic ideas regarding demolition, NEPA and CEQA coordination, and the timeline of activities were discussed. NASA clarified that the driving goal is to meet the 2017 deadline established by DTSC in the 2010 AOC; backtracking milestones from 2017 establishes the aggressive schedule.

***February 24, 2012–***NASA's Allen Elliott (NASA SSFL Program Director), Peter Zorba (NASA SSFL Remedial Project Manager), Amy Keith (NASA SSFL EIS Project Manager), and Merrilee Fellows (NASA Communications) hosted a conference call with a webinar with Mark Malinowski (DTSC SSFL Delivery Manager) and his team to review NASA NEPA surveys and how the data could be used in the CEQA planning process.

***February 2012 through May 2013–***NASA and DTSC participated in a monthly teleconference to discuss the status of fulfilling the 2010 AOC requirements.

***March 15, 2012–***Allen Elliott (SSFL Program Director), Peter Zorba (SSFL Remedial Project Manager), Mark Malinowski (DTSC), and representatives from Boeing and DOE met via teleconference to discuss the path forward for the cumulative impacts analysis. NASA provided an explanation of how cumulative impacts are defined in the EIS. Meeting participants agreed to share information about potential projects that could lead to cumulative impacts with the proposed cleanup at SSFL, including the Boeing and DOE cleanup projects.

***March 28, 2012–***Joint SSFL Core Team/DTSC Meeting. Mark Malinowski requested a description and recap of the March 27 SSFL EIS Information Meeting.

***April 4, 2012–***NASA and DTSC participated in a monthly teleconference to discuss the status of fulfilling the 2010 AOC requirements.

***April 5, 2012–***Follow-up call regarding the NEPA-CEQA cumulative impact methodology. NASA, DOE, and DTSC discussed possible cumulative impact methodology.

***April 18, 2012–***Call with NASA, Boeing, and DOE to coordinate regarding remedial technologies and studies completed to date and to share applicable data and information.

***May 14, 2012–***NASA held a teleconference and webinar with CDFW to discuss the status of biological surveys and studies. Appendix L includes a meeting summary.

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SECTION 6

# Mitigation and Monitoring

Mitigation includes avoiding, minimizing, rectifying, reducing, eliminating, or compensating for an impact by replacing or providing substitute resources or environments (40 *Code of Federal Regulations* 1508.20). Table 6.1-1 lists the mitigation measures identified in the individual resources analyses provided in Section 4. These measures include both best management practices (BMPs) and environmental protection measures, as well as required measures identified through other regulations or consultation.

TABLE 6.1-1
**Best Management Practices and Mitigation Measures Summary**
*NASA SSFL EIS for the Proposed Demolition and Environmental Cleanup*

| BMP or Mitigation Measure No. | BMP and Mitigation Measure Description | Affected Resources |
|---|---|---|
| Soils BMP-1 | NASA would use facilities currently in place to minimize the potential impacts of landslides, should they occur. Where new facilities should be required, each site would be evaluated for landslide potential and effective means of mitigating identified landslide potentials would be assessed before construction. New access roads, staging areas, and stockpile areas would follow natural contours and be graded such that cut-and-fill would be minimized. Also, these areas would be sloped and, if necessary, compacted to prevent the possibility of slope failure. Where new roads and other facilities were necessary, they would be located as to avoid areas identified by the State of California (1998) and those areas identified by geologists in field inspections as having the potential for rock falls. Where such avoidance was impossible, appropriate engineering design and construction measures would be incorporated into the project designs to minimize potential damage to project facilities. Access roads periodically would be inspected, particularly after heavy rains or earthquakes. Access roads and staging in steep portions of the site would be avoided, if possible, after heavy rain events, when increased loads could lead to slope failure. | 4.2 – Soils, Landslide Potential, Topography, and Paleontological Resources |
| Cultural MM-1 | NASA will defer demolition of the Alfa and Bravo Test Stands and Control Houses. Impact Cultural-1c would remain a significant impact with this mitigation measure, but fewer of the significant structures on NASA-administered property would be demolished. | 4.3 – Cultural Resources |
| Cultural MM-2 | Prior to demolition of structures within historic districts, NASA will complete Historic American Engineering Record (HAER) Level I – III documentation of test stands, control houses, and contributing structures in the Alfa, Bravo, and Coca Test Area Historic Districts. Impact Cultural-1c would remain a significant impact with this mitigation measure, but these significant structures will be recorded and documented prior to demolition. | 4.3 – Cultural Resources |
| Cultural MM-3 | NASA will produce an additional, more in-depth ethnographic study of the SSFL area which would build on the 2013 Traditional Cultural Properties investigation. Impact Cultural-2a and 2b would remain significant impacts, but NASA would contribute additional information to the existing literature of the ethnographic history of the area. | 4.3 – Cultural Resources |
| Cultural MM-4 | Prior to cleanup activities, NASA will conduct additional archeological investigations to confirm the extent of the Burro Flats site on NASA-administered land. Impact Cultural-2a, 2b, and 3b would remain significant impacts, but NASA would add critical information to the body of work regarding the significant Burro Flat site. | 4.3 – Cultural Resources |
| Cultural MM-5 | NASA will conduct Extended Phase I archeological investigations in the cleanup area footprint where NASA plans to excavate soil to achieve cleanup goals. Impact Cultural-2a, 2b, and 3b would remain significant impacts, but NASA would add information to the body of work regarding archeological resources and would put in place protection measures for significant archeological sites. | 4.3 – Cultural Resources |

TABLE 6.1-1
**Best Management Practices and Mitigation Measures Summary**
*NASA SSFL EIS for the Proposed Demolition and Environmental Cleanup*

| BMP or Mitigation Measure No. | BMP and Mitigation Measure Description | Affected Resources |
|---|---|---|
| Biology BMP-1 | Given the range and diverse nature of habitats that might be disturbed, a range of restorations would be needed. In soil remediation areas it is anticipated that about one third of the excavated material would be replaced with clean back fill topsoil. Exposed soils are susceptible to wind and water erosion; thus, revegetation would be the preferred method to mitigate soil disturbance. However, it is only a viable option when top soil is present, because subsoil lacks the physical composition and necessary nutrients to support plant life. When topsoil was available, the area would be reseeded using drill, broadcast, or hydro seeding techniques, depending on the slope or remoteness of the disturbed area. The site would be reseeded using an approved native seed mix developed for the Boeing property, which is commercially available. This native seed mix was developed to expedite native plant establishment and to reduce erosion; consequently, it does not contain the same composition of plants currently onsite and would result in a change in plant composition on the reseeded sites. NASA may also plant shrubs and trees depending on the final contours and soil cover.<br>It can take years for native species to reestablish in disturbed areas and the species composition would be different then what was originally there, despite reseeding with the approved native seed mix. The restoration goal would be 50 percent native plant cover, 3 years after disturbance. | 4.2 – Soils, Landslide Potential, Topography, and Paleontological Resources<br>4.4 – Biology |
| Biology BMP-2 | In conjunction with reseeding and when topsoil is unavailable, soil stabilization BMPs would be used, including soil binders, erosion mats, gabion walls, and erosion control check dams. Soil amendments also would be used to help in the reseeding success. Appropriate restoration measures would be prescribed based on site location, slope, and remoteness.<br>Furthermore, a Stormwater Pollution Prevention Plan (SWPPP) and an Erosion Control Plan (ECP) would be updated and implemented to guide erosion control methodology. In addition, a project Dust Control Plan would be developed to prevent soil erosion. | 4.2 – Soils, Landslide Potential, Topography, and Paleontological Resources<br>4.4 – Biology |
| Biology BMP-3 | Once groundwater remediation reaches the desired level, wells would be removed and the area would be reseeded. | 4.4 – Biology |
| Biology BMP-4 | Individuals working on cleanup and demolition activities would be trained to identify federal- and state-listed species. If a listed species were observed during operations, operations would halt and a qualified wildlife biologist would be called to the site. If the species were validated as a listed species, the U.S. Fish and Wildlife Service (USFWS) or California Department of Fish and Wildlife (CDFW) would be consulted. | 4.4 – Biology |
| Biology BMP-5 | NASA would obtain a Clean Water Act (CWA) Section 404 Permit from the U.S. Army Corps of Engineers and a CWA Section 401 permit from the Regional Water Quality Control Board for the discharge or dredge of material into jurisdictional waters of the U.S. | 4.4 – Biology |
| Biology MM-1 | If the cleanup can be done in a manner compliant with the 2010 AOC, the soil would be removed with pick axes, shovels, or a vacuum truck, in areas where sensitive resources occur. When possible, the least detrimental remediation technologies would be used in areas with the oak trees. | 4.4 – Biology |
| Biology MM-2 | NASA would avoid Santa Susana tarplant to the extent possible. Individuals working on cleanup and demolition activities would be trained to identify the Santa Susana tarplant and avoid it; however, Santa Susana tarplant populations may still be disturbed or killed if they are located on an identified soil cleanup, demolition, or mitigation site. | 4.4 – Biology |
| Biology MM-3 | NASA would implement a weed management plan to eradicate noxious an invasive species as they appear on sites using federally approved methodologies. | 4.4 – Biology |

TABLE 6.1-1
**Best Management Practices and Mitigation Measures Summary**
*NASA SSFL EIS for the Proposed Demolition and Environmental Cleanup*

| BMP or Mitigation Measure No. | BMP and Mitigation Measure Description | Affected Resources |
|---|---|---|
| Biology MM-4 | Project sites would be surveyed for the presence of migratory bird nests by a qualified biologist prior to work commencing. NASA has consulted with USFWS to establish appropriate mitigation to protect migratory birds present during cleanup operations.. | 4.4 – Biology |
| Biology MM-5 | The following mitigation measures were identified by the USFWS to mitigate potential impacts to federally threatened or endangered listed species (USFWS, 2013b). Prior to any construction activities, NASA will conduct protocol-level surveys in all suitable habitats for Braunton's milk-vetch, California red-legged frog, Least Bell's vireo, Riverside fairy shrimp, and vernal pool fairy shrimp. If a federally listed species is identified, activities will halt and NASA will initiate formal consultation with the USFWS, during which time additional mitigation measures will be developed. Further additional dialogue will occur with the USFWS if rock basins are impacted by the Proposed Action. Where rock basins occur near construction areas, exclusion fencing will be set up. Based on the actions described here, there are no expected impacts to any federally listed species. | 4.4 – Biology |
| Traffic MM-1 | A NASA Construction Transportation and Control Plan (N-CTCP)—similar to Boeing's existing CTCP, which includes a traffic control plan, parking plan, existing and construction traffic operations, motorist information strategies, truck safety plan, hazardous materials transport plan, and ridesharing plan—will be developed. The N-CTCP would include the proposed activities and be implemented through the completion of cleanup activities, which is planned for 2017. NASA will coordinate traffic control plans with Boeing and DOE. | 4.5 – Traffic and Transportation |
| Traffic MM-2 | In anticipation of the roadway damage identified (Traffic Impact-4), NASA would survey Woolsey Canyon Road conditions prior to the commencement of work and would repair damage caused by its demolition and cleanup activities. NASA would seek to enter into an agreement with The Boeing Company and Department of Energy to share this work. | 4.5 – Traffic and Transportation<br>4.8 – Environmental Justice |
| Water BMP-1 | Site activities would take place in accordance with the statewide General Permit for Stormwater Discharges Associated with Construction Activity (Order No. 2009-0009-DWQ [National Pollutant Discharge Elimination System No. CAS000002]). As required by this permit, NASA would prepare an SWPPP and an ECP that specified site management activities to protect stormwater runoff and to minimize erosion during construction, operation, and maintenance of the project. NASA also would continue monitoring offsite drainages for increased sediment load and contamination. The SWPPP would include the protocol for proper storage and use of hazardous materials, as well as spill response procedures.<br>These management activities would include construction stormwater BMPs (silt fences, sand bags, straw waddles, and tire washes), dewatering runoff controls, containment for chemical storage areas, and construction equipment decontamination. The combined effect of demolition and remediation activities on the potential to increase surface water and groundwater pollution would be minor, given the regulatory controls in place to protect water quality and the assumption that NASA would adhere to these requirements. | 4.2 – Soils, Landslide Potential, Topography, and Paleontological Resources<br>4.4 – Biology<br>4.6 – Water<br>4.12 – Hazardous and Nonhazardous Materials and Waste |
| Air Quality BMP-1 | Fugitive dust emissions would be controlled by measures prescribed by Ventura County Air Pollution Control District (VCAPCD) Rule 55 (VCAPCD, 2008a), which are currently implemented by NASA as part of its ISRA program (NASA, 2010b), and VCAPCD Rule 74.29 (VCAPCD, 2008b), some of which are consistent with VCAPCD Rule 55. The relevant measures available to reduce both onsite and offsite fugitive dust emissions are summarized in the following bullets; implementation of these measures would be further described in the Dust Control Plan:<br>• ***Unpaved Roads***: Cover road with a low-silt content material such as recycled road base or gravel to a minimum of 4 inches or reduce speed to 15 miles per hour; restrict public access; and treat with water, mulch, or a non-toxic chemical dust suppressant that complies with the applicable air and water quality government standards. It is expected that reduced vehicle speeds could reduce fugitive dust emissions by up to 57 percent whereas application of water or non-toxic dust suppressants could reduce fugitive dust | 4.7 – Air Quality |

TABLE 6.1-1
**Best Management Practices and Mitigation Measures Summary**
*NASA SSFL EIS for the Proposed Demolition and Environmental Cleanup*

| BMP or Mitigation Measure No. | BMP and Mitigation Measure Description | Affected Resources |
|---|---|---|
| | emissions by up to 55 and 84 percent, respectively (Countess Environmental, 2006).<br>• ***Stockpiles*:** Enclose material in a three- or four-sided barrier equal to the height of the material; apply water at a sufficient quantity and frequency to prevent wind-driven dust; apply a non-toxic dust suppressant that complies with the applicable air and water quality government standards; or install and anchor tarps, plastic, or other material. It is expected that enclosure of the material could reduce fugitive dust emissions by up to 75 percent whereas application of water or non-toxic dust suppressants could reduce fugitive dust emissions by up to 90 percent (Countess Environmental, 2006).<br>• ***Material Loading*:** Load materials carefully to minimize the potential for spills or dust creation. Implement water spraying as needed to suppress potential dust generation during loading operations. Take care to apply dust suppression water to the top of the load or source material to avoid wetting the truck tires. Do not perform loading during unfavorable weather conditions (such as high winds or storms). Material spilled during loading would be collected for subsequent loading. After loading, trucks would pass through the decontamination and inspection station before weighing and departure from SSFL. Decontaminate trucks by dry brushing before they leave the staging and loading areas to prevent track out. Materials from the truck decontamination would be collected and hauled out with the last load of soil. It is expected that application of water during loading operations could reduce fugitive dust emissions by up to 69 percent whereas ceasing loading operations during unfavorable weather conditions could reduce fugitive dust emissions by up to 98 percent (Countess Environmental, 2006). Fugitive dust emissions after loading would be addressed through the paved road measures described below.<br>• ***Material Hauling*:** Use properly secured tarps that cover the entire surface area of the load or use a container-type enclosure, maintain a minimum of 6 inches of freeboard, or water or otherwise treat the bulk material to minimize loss of material to wind or spillage. It is expected that use of secured tarps and maintaining 6 inches of freeboard could reduce fugitive dust emissions by up to 91 percent, whereas watering bulk materials could reduce fugitive dust emissions by up to 69 percent (SCAQMD, 2007). Fugitive dust emissions during offsite material hauling would be further minimized by the paved road measures described in the following text.<br>• ***Paved Roads:*** Install a pad near the SSFL exit consisting of washed gravel to a depth of at least 6 inches, extending at least 30 ft wide and 50 ft long; pave the surface near the SSFL exit at least 100 ft long and 20 ft wide; use a rumble grate to remove bulk material from tires and vehicle undercarriages before vehicles exit SSFL; or install and use a wheel washing system to remove bulk material from tires and vehicle undercarriages before vehicles exit SSFL. It is expected that installation of a pad or paved surface could reduce fugitive dust emissions by up to 46 percent whereas installation of a rumble grate or wheel washing system could reduce fugitive dust emissions by up to 80 percent (Countess Environmental, 2006).<br>• ***Soil Aeration:*** Use a certified organic vapor analyzer at least once every 15 minutes during excavation and grading activities to confirm the aeration of contaminated soil is minimized or prevented. Records must be kept throughout the environmental cleanup period, consistent with VCAPCD Rule 74.19 (VCAPCD, 2008b).<br>The greater the amount of soil that is disturbed by any of the methods described above, the greater the amount of contaminated fugitive dust that would be released. | |

TABLE 6.1-1
**Best Management Practices and Mitigation Measures Summary**
*NASA SSFL EIS for the Proposed Demolition and Environmental Cleanup*

<table>
<tr><th>BMP or Mitigation Measure No.</th><th>BMP and Mitigation Measure Description</th><th>Affected Resources</th></tr>
<tr><td>Air Quality MM-1</td><td>To comply with the General Conformity Rule, NASA could purchase oxides of nitrogen (NOx) offsets for the affected counties (i.e., counties in which the General Conformity de minimis threshold values were exceeded). The quantity of NOx offsets purchased by NASA would equal the quantity by which the General Conformity de minimis threshold values were exceeded (Tables 4.7-4 and 4.7-5), which would be verified by adhering to an annual truck limit based on the daily truck frequencies presented in Table 4.7-3.</td><td>4.7 – Air Quality</td></tr>
<tr><td>Air Quality MM-2</td><td>To the extent feasible and to reduce greenhouse gas (GHG) emissions associated with material hauling and construction equipment, NASA might consider using newer model-year haul trucks or alternative-fueled construction equipment, which would have a co-benefit of reducing criteria pollutant emissions as well as GHG emissions.</td><td>4.7 – Air Quality</td></tr>
<tr><td>Air Quality MM-3</td><td>NASA would develop a Dust Control Plan for the project to protect soils from wind erosion and prevent future fugitive dust emissions to the extent feasible. As described in Section 4.9, dust monitors would be placed around the work site to monitor the amount of airborne dust. The air monitors could be equipped to record dust levels on a specified interval and have an alarm that will notify workers if dust levels reach a specified level. After project activities were completed in an area, native seed mix would be planted to replace native vegetation destroyed during excavations, road construction, soil remediation, and other activities (new vegetation would not be planted in areas that did not have plants previously). Restoring the native vegetation would prevent soil erosion which promotes fugitive dust emissions.</td><td>4.2 – Soils, Landslide Potential, Topography, and Paleontological Resources<br>4.4 – Biology<br>4.7 – Air Quality<br>4.9 – Health and Safety<br>4.12 – Hazardous and Nonhazardous Materials and Waste</td></tr>
<tr><td>Environmental Justice</td><td>No impacts are expected.</td><td>4.8 – Environmental Justice</td></tr>
<tr><td>Health BMP-1</td><td>A Health and Safety Plan (HSP) would be developed for the proposed activities and implemented prior to the Proposed Action and would include the following:<br>• General hazard controls<br>• Monitoring requirements<br>• Project-specific hazard controls such as asbestos, lead-based paint, and earthmoving equipment<br>• Traffic control<br>• Physical hazard controls such as noise and temperature extremes<br>• Biological hazard controls<br>Designated areas for chemical storage and handling would be identified. The plan would be reviewed for the project activities and include procedures to mitigate potential hazards, measures that provide protection from physical hazards, measures that provide protection from chemical hazards that might be present at the site, decontamination procedures, and worker and health and safety monitoring criteria to be implemented during project activities, if needed. Per 29 CFR Part 1910, Hazardous Waste Operations and Emergency Response Standard, safety training for site workers must be met in order to conduct cleanups or emergency response operations. In addition, associated worker safety training would occur before ground disturbing activities began. Work zones would be marked clearly with barricades or construction fencing to control unauthorized access to the areas. In addition, if dust or chemical monitoring is required during demolition or during soil and groundwater remediation activities, it would be implemented according to the site-specific HSP, which would list the proper action limits at which controls would be required.</td><td>4.9 – Health and Safety<br>4.12 – Hazardous and Nonhazardous Materials and Waste</td></tr>
</table>

TABLE 6.1-1
**Best Management Practices and Mitigation Measures Summary**
*NASA SSFL EIS for the Proposed Demolition and Environmental Cleanup*

| BMP or Mitigation Measure No. | BMP and Mitigation Measure Description | Affected Resources |
|---|---|---|
| Health BMP-2 | A standard operating procedure document (*The Standard Operating Procedures: Building Demolition Debris Characterization and Management for Santa Susana Field Laboratory* [NASA, 2011a]) would be updated to include dust suppression measures (water misting and spraying devices during demolition and soil removal activities to minimize dust emissions) and site preparation activities (a secure demolition permit and established demolition work zones with controlled access). This BMP entails establishing dust monitors around the work site to monitor the amount of airborne dust. The air monitors could be equipped to record dust levels on a specified interval and have an alarm that will notify workers if dust levels reach a specified level. These measures also would be captured in the project Dust Control Plan. Additionally, if a tank containing contaminant of concern (COCs) or chemicals were discovered during demolition, the contents would be sampled, removed, and properly disposed. Tanks of unknown application and/or identification status were included in the Sitewide Inventory (NASA, 2012b). Personnel involved in the demolition activities would follow the requirements in the site-specific HSP before onsite activities start. | 4.9 – Health and Safety |
| Health BMP-3 | A Hazardous Substance Control and Emergency Response Plan would be prepared to include project-specific hazard controls for dust, lead-based paint, asbestos, heavy metals, pesticides, petroleum products, polychlorinated biphenyls from transformers, other COCs, and spill containment procedures in the unlikely event that chemicals should be found during pre-demolition. Required personal protective equipment and worker training and qualification would be included in the site-specific HSP. | 4.9 – Health and Safety |
| Infrastructure BMP-1 | Prior to excavation activities, NASA would be required by California law (California Government Code Sec. 4216, *et seq.)* to contact California's Dig Alert and potentially a third-party utility-locating service to mark existing utility lines correctly within and near the remediation areas. In situations where utility lines require temporary disconnection or a permanent relocation, coordination with the utility provider would minimize the impact of remedial activities. | 4.10 – Site Infrastructure and Utilities |
| Infrastructure MM-1 | The buildings (except those protected as historical sites), and portions of the existing utilities (natural gas, sewer, and test support lines) would not be required during remedial operations. By scheduling the demolition and removal of these portions of the site infrastructure before remedial actions commence, NASA would be able to remove the impact of these features on the progress of the remedial effort | 4.10 – Site Infrastructure and Utilities |
| Noise MM-1 | NASA would limit proposed demolition and environmental cleanup activities and hauling to daytime hours. | 4.11 – Noise |
| Noise MM-2 | Construction equipment and trucks would be maintained in good working order, construction equipment and trucks would be maintained per manufacturers' recommendations. | 4.11 – Noise |
| Haz BMP-1 | Hazardous demolition materials and wastes from demolition and from operation of remediation technologies would be handled in compliance with the applicable federal, state, and local laws and regulations, including licensing, training of personnel, accumulation limits and times, prevention and response to spills and releases, and reporting, and record keeping.<br>Per these regulatory standards, hazardous wastes generally would be loaded directly into bins for transport and offsite disposal; however, containment, if needed, would be in containers that prevent the release of material or hazardous content. Bins containing hazardous wastes would be kept securely closed, except when wastes were being transferred into or out of them, and would be transported for offsite disposal within the prescribed 90-day accumulation period (NASA, 2011a). | 4.12 – Hazardous and Nonhazardous Materials and Waste |

TABLE 6.1-1
**Best Management Practices and Mitigation Measures Summary**
*NASA SSFL EIS for the Proposed Demolition and Environmental Cleanup*

| BMP or Mitigation Measure No. | BMP and Mitigation Measure Description | Affected Resources |
|---|---|---|
| Haz BMP-2 | As required by California Health and Safety Code Chapter 6.95 and the California Code of Regulations, Title 19, a Hazardous Materials Business Plan would be developed. This plan would describe appropriate storage, containment, and safety protocols for use of hazardous materials during the remediation; emergency procedures to be followed in the event of a release; instructions for performing fueling and maintenance operations on vehicles and equipment onsite; and other protocols so that hazardous materials would be stored and handled appropriately. | 4.12 – Hazardous and Nonhazardous Materials and Waste |

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SECTION 7

# List of Preparers

NASA prepared this EIS for the proposed demolition and environmental cleanup activities at SSFL. The individuals and organizations listed in Table 7.1-1 contributed to the overall effort of preparing this document.

TABLE 7.1-1
**List of Preparers for Environmental Impact Statement**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| | | |
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| Allen Elliott | Marshall Space Flight Center SSFL Program Director | |
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| Merrilee Fellows | NASA Headquarters Environmental Communications | |
| ***CH2M HILL** (Contractor to NASA)* | | |
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| Lyna Black | NEPA Technical Lead | 15 |
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| Tom Simpson | NEPA Senior Technical Consultant | 35 |
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| Michelle Rau | Biologist and Environmental Planner, Biological Resources Lead, Graphics Coordination, Cumulative Effects Analysis, NEPA Technical Support | 14 |
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| Steve Long | Senior Biologist, Biological Resources Senior Reviewer | 29 |
| Laurel Karren | Biologist, Biological Assessment | 20 |
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| Clint Helton | Senior Cultural Resources Specialist, Cultural Resources Senior Reviewer | 16 |
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**List of Preparers for Environmental Impact Statement**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

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| Steven Lanter | Senior Geologist, Geology and Soils Senior Reviewer | 31 |
| Randy Dean | Geologist, Site Health and Safety Officer, Geology and Soils Senior Reviewer | 13 |
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| Loren Bloomberg | Senior Environmental Engineer, Transportation Senior Reviewer | 21 |
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| Vicky Potter | Technical Editor, Publications Lead | 31 |
| Chenita Stanley | Document Processor, Lead | 7 |
| Jean Koch | Technical Editor | 21 |
| Taylor Fleet | Technical Editor and Document Processor | 18 |
| Denise Godwin | Administrative Assistant | 18 |
| Virginia Wilson | Administrative Record | 13 |

TABLE 7.1-1
**List of Preparers for Environmental Impact Statement**
*NASA SSFL EIS for Proposed Demolition and Environmental Cleanup*

| | | |
|---|---|---|
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| ***UNITeS** (**Contractor to NASA**)* | | |
| Alberta Cooley | Graphics and GIS Support | 23 |
| Scott Stevens | Graphics and GIS Support | 35 |

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SECTION 8

# Glossary

**Alluvium**–Material deposited by rivers. It is usually most extensively developed in the lower part of the course of a river, forming floodplains and deltas, but might be deposited at any point where the river overflows its banks or where the velocity of a river is checked—for example, where it runs into a lake.

**Analyte**–Metals, radionuclides, and some organic compounds, such as dioxins from wildfires.

**A-Weighted Sound Level in Decibels**–Sound level in decibels as measured on a sound level meter using the A-weighted filter network. The A-weighted filter deemphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise.

**Background Level**–Levels of chemical or physical agents normally found in the environment. Two types of background levels might exist for chemical substances or physical agents: 1) naturally occurring levels–ambient concentrations of substances or agents present in the environment, without human influence; or 2) anthropogenic levels–concentrations of substances or agents present in the environment due to human-made, non-site sources (such as automobiles or industries).

**Criteria Pollutants**–Consist of six principal pollutants (carbon monoxide, lead, nitrogen dioxide, ozone, particulate matter, and sulfur dioxide). These criteria pollutants are used to evaluate whether an area is considered to be in attainment or not under the Clean Air Act regulations.

**Demolition**–Structural characterization, dismantling and demolition, containment, and removal of site structures.

**Disposition**–Administrative act of transferring title out of federal ownership.

**Environmental Justice**–The fair treatment of people of all races, income, and cultures with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Environmental justice further requires meaningful involvement of these groups in the decision-making processes of the government.

**Greenhouse Gas**–Emissions regulated at the federal level for the following: carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, and other fluorinated gases including nitrogen trifluoride and hydrofluorinated ethers.

**Groundwater**–For purposes of this analysis, this is water within the alluvium and/or weathered bedrock and the Chatsworth formation aquifer (that is, that present within the unweathered portions of bedrock). As defined in the 2010 Administrative Order on Consent, groundwater also can include soils contaminated by soil vapor (volatile organic compounds [VOCs]) from groundwater.

**Historic Property**–Any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places.

**Impaired Waters**–Waters that are too polluted or otherwise degraded to meet the water quality standards set by states, territories, or authorized tribes and as determined under Section 303(d) of the Clean Water Act.

**Laboratory Method Reporting Limit**–Lowest concentration at which an analyte confidently can be detected in a sample and its concentration could be reported with a reasonable degree of accuracy and precision.

**Level of Service (LOS)**–A qualitative measure of roadway capacity and operating conditions. LOS is related directly to vehicle delay. LOS is given a letter designation from A to F, with LOS A representing extremely short delays and LOS F representing extremely long delays.

**Paleontology**–Scientific study of life forms that existed in the earth's distant past as revealed though the examination of fossils of plants, animals, and other organisms. Included is the study of body fossils, tracks (ichnites), burrows, cast-off parts, fossilized feces (coprolites), palynomorphs (tiny organic particle of a size between five and 500 micrometers), and chemical residues.

**Risk-based Protocol**–Used to assess human health and ecological exposure scenarios. The receptors present at SSFL must have the potential for exposure to analytes detected in the soil and groundwater for a risk to be present. Once the potential for exposure to receptors has been confirmed, various degrees of exposure can be evaluated. The parameters used to evaluate risks to receptors include the duration of exposure, the type of contamination to which a sensitive receptor would be exposed, the frequency of exposure, and the relative toxicity of the contaminant

**Sacred Site**–Any specific, discrete, narrowly delineated location on federal land that is identified by an Indian tribe, or Indian individual determined to be an appropriately authoritative representative of an Indian religion, as sacred by virtue of its established religious significance to, or ceremonial use by, an Indian religion; provided that the tribe or appropriately authoritative representative of an Indian religion has informed the agency of the existence of such a site.

**Soils**–For purposes of this analysis, soil is defined in the 2010 Administrative Order on Consent as saturated and unsaturated soil, sediment, and weathered bedrock, debris, structures, and other anthropogenic materials. “Soils” does not include surface water, groundwater, air, or biota.

**Test Stand**–Open-framed, metal structures with concrete foundations (and related buildings) where mechanical and vibrational tests were conducted on engines. At SSFL, they were built in support of Space Shuttle Main Engine activities and consisted of four testing locations–Alfa, Bravo, Coca, and Delta.

**Total Maximum Daily Load (TMDL)**–A calculation of the maximum amount of a pollutant that a water body can receive and still safely meet water quality standards.

**Wetlands**–Areas that are “inundated by surface water or groundwater with 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.”

**Waters of the United States**–Non-wetland waters of the U.S. include features such as rivers, streams, lakes, and ponds.

SECTION 9

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# References


Amtrak. 2012. Amtrak Pacific Surfliner. http://www.amtrakcalifornia.com/index.cfm/routes/pacific-surfliner/. Accessed July 21, 2013.

Baldwin, B.G., D.H. Goldman, D.J. Keil, R. Patterson, T.J. Rosatti, and D.H. Wilkins, editors. 2012. *The Jepson Manual: Vascular Plants of California, Second Edition*. University of California Press, Berkeley. *Jepson eFlora*. http://ucjeps.berkeley.edu/cgi-bin/get_IJM.pl?tid=80176. Accessed March 21, 2013.

California Department of Food and Agriculture (CDFA). 2011. Noxious Weed Information Project. http://www.cdfa.ca.gov/phpps/ipc/noxweedinfo/noxweedinfo_hp.htm.

California Department of Transportation (Caltrans). 2009. Technical Noise Supplement (TeNS). http://www.dot.ca.gov/hq/env/noise/pub/tens_complete2009RedlineScreenProcess.pdf.

California Department of Transportation (Caltrans). 2011. Caltrans PeMS Traffic Data. Caltrans Performance Measurement System (PeMS). Data compiled and accessed in 2011. http://pems.dot.ca.gov/?redirect=%2F%3Fdnode%3DState.

California Department of Transportation (Caltrans). 2013. Weight Limitations. Office of Truck Services. http://www.dot.ca.gov/hq/traffops/trucks/trucksize/weight.htm. June.

California Environmental Protection Agency (Cal/EPA) Department of Toxic Substances Control (DTSC). 2007. *Consent Order for Corrective Action, Health and Safety Code Section* 25187. Docket No. P3-07108-003.

California Environmental Protection Agency (Cal/EPA) Department of Toxic Substances Control (DTSC). 2010. *Administrative Order on Consent for Remedial Action, Health and Safety Code Section* 25355.5(a)(1)(B), 58009 and 58010*.* Docket No. HSA-CO 10/11–038.

California Geological Survey (CGS). 2007. *Fault-Rupture Hazard Zones in California*, *Alquist-PrioloFault Zoning Act with Index to Earthquake Fault Zones Maps*. Special Publication 42, Interim Revision. Department of Conservation, California Geological Survey, Sacramento, California.

California Invasive Pest Plant Council (CAL-IPC). 2012. Invasive plant inventory. Available at: http://www.cal-ipc.org/ip/inventory/index.php. Accessed May 17.

California Native Plant Society (CNPS). 2013. *Inventory of Rare, Threatened and Endangered Plants of California.* Available at: http://www.rareplants.cnps.org. Accessed March 21.

California Regional Water Quality Control Board (CRWQCB). 2009. Revised Tentative Waste Discharge for the Boeing Company, Santa Susana Field Laboratory, Order No. R4-2009-00XX, Amending Order No. R4-2007-0055 (NPDES No. CA0001309). Los Angeles Region. March 11; Revised April 6. http://www.boeing.com/assets/pdf/aboutus/environment/santa_susana/water_quality/permits/apr07_RevisedTENTWDR.pdf.

California Regional Water Quality Control Board (CRWQCB). 2010. Waste Discharge for the Boeing Company, Santa Susana Field Laboratory, Order No. R4-2010-0090, NPDES No. CA0001309. Los Angeles Region. April 6; Revised May 20; Revised June 3. http://63.199.216.6/larwcqb_new/permits/docs/6027_R4-2010-0090_WDR_PKG.pdf

Camp Dresser & McKee/Science Application International Corporation (CDM/SAIC). 2011. *Draft Field Sampling Plan Traffic and Noise Monitoring at Area IV, Santa Susana Field Laboratory, Ventura County, California*. Prepared for the U.S. Department of Energy. August.

City of Los Angeles. 2012. Department of Transportation. *Pedestrian Routes to School*. Available at: http://ladot.lacity.org/tf_safe_routes_school.htm#Ele-N.

Colburn, I. P. 1981. "Paleogeographic Interpretation of the Chatsworth Formation." *In:* Link, M. H., R. L. Squires, and I. P. Colburn, eds. *Simi Hills Cretaceous Turbidites, Southern California.* Society of Economic Paleontologists and Mineralogists, Los Angeles, California.

Colburn, I. P. 1981. "Paleogeographic Interpretation of the Chatsworth Formation." *Simi Hills Cretaceous Turbidites, Southern California; Volume and Guidebook*. Ed. Martin H. Link, Richard L. Squires, Ivan P. Colburn. Published by The Pacific Section, Society of Economic Paleontologists and Mineralogists. Los Angeles, California. October 10.

Council on Environmental Quality (CEQ). 1978. *Regulations for Implementing NEPA*. Available at: http://ceq.hss.doe.gov/nepa/regs/ceq/toc_ceq.htm. Accessed October 10, 2012.

Council on Environmental Quality (CEQ). 1997a. *Considering Cumulative Effects Under the National Environmental Policy Act; Council on Environmental Quality*. Council on Environmental Quality, Executive Office of the President. January.

Council on Environmental Quality (CEQ). 1997b. *Environmental Justice Guidance Under the National Environmental Policy Act*. Council on Environmental Quality, Executive Office of the President. December 10.

Council on Environmental Quality (CEQ). 2010. *Memorandum for Heads of Federal Departments and Agencies*. Draft NEPA Guidance on Consideration of the Effects of Climate Change and Greenhouse Gas Emissions. February 18.

Countess Environmental. 2006. WRAP Fugitive Dust Handbook. Prepared for Western Governors' Association, Denver, Colorado. Prepared by Countess Environmental, Westlake Village, California. September 7.

County of Los Angeles. 1974. *Noise Element, Proposed Element Draft Environmental Impact Report*. October.

County of Los Angeles. 1980. *General Plan Transportation Element*. 56 p.

County of Los Angeles. 2012. *Chapter 12: Noise Controls*, Title 12 Environmental Protection, State of California. Cited as 1978 Noise Control Ordinances 11778 and 11773. http://search.municode.com/html/16274/_DATA/TITLE12/Chapter_12_08_NOISE_CONTROL.html. Website accessed August 10.

County of Los Angeles, Department of Public Works. 2012. Countywide Integrated Waste Management Plan. 2011 Annual Report; County of Los Angeles Public Works Department. August.

Davis, Frank, et. al. 1994. *Distribution and conservation status of coastal sage scrub in southwestern California.* Journal of Vegetation Science.

Emmick, Jamelon, M.A., and James C. Bard Ph.D. 2008. *Final Cultural Resources Inventory of Santa Susana Field Laboratory NASA Areas I and II, Ventura County, California*. Prepared for National Aeronautics and Space Administration Marshall Space Flight Center; Huntsville, Alabama. Prepared with the assistance of Raena Ballantyne, B.S., Robert M. Harmon, M.A., and Patricia Lyttle, B.S. April. This is a confidential report.

Entomological Consulting Services, Ltd. (ECS). 2012. *Habitat Assessment for the Endangered Quino Checkerspot Butterfly at the NASA-Administered Areas I And II of the Santa Susana Field Laboratory.* April.

Environmental Laboratory. 1987. *Corps of Engineers Wetland Delineation Manual.* January.

Federal Highway Administration (FHWA). 2006. *Roadway Construction Noise Model User's Guide.* FHWA-HEP-05-054, DOT-VNTSC-FHWA-05-01. January.

Federal Highway Administration (FHWA). 2009. Air Quality, Transportation & Toxic Air Pollutants *Memorandum: Interim Guidance Update on Mobile Source Air Toxic Analysis in NEPA Documents.* U.S. Department of Transportation. September 30. http://www.fhwa.dot.gov/environment/air_quality/air_toxics/policy_and_guidance/aqintguidmem.cfm. Accessed May 15, 2012.

Florida Department of Transportation (FDOT). 2009. *2009 Quality/Level of Service Handbook.* State of Florida Department of Transportation, Systems Planning Office. Tallahassee, Florida.

Freshman and Menzie. 1996. Two wildlife exposure models to assess impacts at the individual and population levels and the efficacy of remedial actions. In *Human and Ecological Risk Assessment: An International Journal* Volume 2, Issue 3.

Hogan, Michael and Bai "Tom" Tang. 2010. *Cultural Resources Identification Survey, Northern Undeveloped Land at the Santa Susana Field Laboratory Site, Simi Hills Area, Ventura County, California*. Prepared for CDM Federal Services. Ms on file at the South Central Coastal Information Center, California State University, Fullerton, California.

Holland, Robert. 1986. *Preliminary Descriptions of the Terrestrial Natural Communities of California*. State of California. October

Kew, W. S. W. 1924. *Geology and Oil Resources of a Part of Los Angeles and Ventura Counties, California.* United States Geological Survey Bulletin 753, Maps at scale 1:62,500.

Knight, Albert. 1991. *Site Record CA-VEN-1072*. Ms. on file at the South Central Coastal Information Center, California State University, Fullerton, California. This is a confidential record.

Knight, A. 2012. "Three Chumash Style Rock Art Sites in Fernandeño Territory." Paper presented at the Society for California Archaeology (SCA). 2012. $46^{th}$ Annual Meeting: Symposium 16 Recent Archaeology in the Western San Fernando Valley and Environs. This is a confidential record.

Los Angeles County Metropolitan Transportation Authority (LA Metro). 2010. *2010 Congestion Management Program*. Prepared by Long Range Planning and Coordination. Los Angeles, California.

Los Angeles Regional Water Quality Control Board (LARWCQB). 2005a. Resolution No. R4-2005-010. *Amendment to the Water Quality Control Plan – Los Angeles Region to Incorporate a Total Maximum Daily Loads (TMDLs) for Organochlorine (OC) Pesticides, Polychlorinated Biphenyls (PCBs) and Siltation in Calleguas Creek, Its Tributaries, and Mugu Lagoon*. July.

Los Angeles Regional Water Quality Control Board (LARWCQB). 2005b. Resolution No. R4-2005-009. *Amendment to the Water Quality Control Plan – Los Angeles Region to Incorporate the Total Maximum Daily Load for Toxicity, Chlorpyrifos, and Diazinon in the Calleguas Creek, its Tributaries and Mugu Lagoon*. July.

Los Angeles Regional Water Quality Control Board (LARWCQB). 2007. *Resolution No. R4-2007-007. Proposed Amendments to the Water Quality Control Plan – Los Angeles Region for the Revolon Slough and Beardsley Wash Trash TMDL*.

Los Angeles Regional Water Quality Control Board (LARWCQB). 2008a. *State Water Resources Control Board Resolution No. 2008-0033*. May 20.

Los Angeles Regional Water Quality Control Board (LARWCQB). 2008b. *Regional Water Quality Control Board, Los Angeles Region, Resolution No. R4-2008-009*. September 11.

Los Angeles Regional Water Quality Control Board (LARWCQB). 2010. *Resolution No R-10-003 Amendment to the Water Quality Control Plan for the Los Angeles Region to Revise the Los Angeles River and Tributaries Metals TMDL*. May 6.

Los Angeles Regional Water Quality Control Board (LARWCQB). 2011. *Los Angeles Regional Water Quality Control Board, Revised Attachment A to Board Resolution R10-007*. October 19.

Metrolink. 2012. Metrolink Trains. http://media.metro.net/riding_metro/maps/images/metro_metrolink_map.pdf. Accessed July 21, 2013.

Miles, S.R. and C.B. Goudey. 1998. Ecological Subregions of California, Section and Subsection Descriptions. U.S. Forest Service, Pacific Southwest Region, San Francisco CA. Prepared in cooperation with: USDA, Natural Resources Conservation Service and USDI, Bureau of Land Management. Internet publication R5-EM-TP-005-NET.

MWH Americas, Inc. (MWH). 2005. *Standardized Risk Assessment Methodology (SRAM) Work Plan, Santa Susana Field Laboratory, Ventura County, California. Revision 2 – Final*. September.

MWH Americas, Inc. (MWH). 2007a. *Work Plan, Groundwater Interim Measures, Santa Susana Field Laboratory, Ventura County, California*. Prepared for The Boeing Company, National Aeronautical and Space Administration, and U.S. Department of Energy. August. 24 p.

MWH Americas, Inc. (MWH). 2007b. *Group 4–Southern Portion of Area II RCRA Facility Investigation Report, Santa Susana Field Laboratory, Ventura County, California*. *Volume I-Text, Tables, and Figures*. August.

MWH Americas, Inc. (MWH). 2007c. *Geologic Characterization of the Central Santa Susana Field Laboratory, Ventura County, California.* Prepared for the Boeing Company, the National Aeronautics and Space Administration, and the United States Department of Energy. August.

MWH Americas, Inc. (MWH). 2008. Work Plan, Groundwater Interim Measures Addendum, Santa Susana Field Laboratory, Ventura County, CA. February.

MWH Americas, Inc. (MWH). 2009a. Feasibility Study Work Plan, Santa Susana Field Laboratory, Ventura County, CA. April.

MWH Americas, Inc. (MWH). 2009b. *Draft Site-Wide Groundwater Remedial Investigation Report, Santa Susana Field Laboratory, Ventura County, California.* Prepared for The Boeing Company, The National Aeronautics and Space Administration, and the United States Department of Energy. December.

MWH Americas, Inc. (MWH). 2009c. *Draft Site-Wide Groundwater Remedial Investigation Report, Santa Susana Field Laboratory, Ventura County, California. Appendix 9-A Groundwater Risk Assessment.* Prepared for The Boeing Company, The National Aeronautics and Space Administration, and the United States Department of Energy. December.

MWH Americas, Inc. (MWH). 2011. *APPENDIX A – Regulatory Correspondence*, ISRA Phase II Implementation Report – 2010 Activities, Santa Susana Field Laboratory, Ventura County, California. April.

MWH Americas, Inc. (MWH). 2012a. "Sanitary Sewer System GIS Feature Class, Santa Susana Field Laboratory, Ventura County, California," Technical Memorandum prepared for The Boeing Company (Boeing), U.S. Department of Energy (DOE), and National Aeronautical and Space Administration (NASA). April 6.

MWH Americas, Inc. (MWH). 2012b. *Treatability Study Work Plan Addendum #1*, *In Situ Chemical Oxidation Field Experiment* (MWH, 2012) Final In Situ Chemical Oxidation Field Experiment Work Plan Addendum #1, Santa Susana Field Laboratory, Ventura County, California. September.

National Aeronautics and Space Administration (NASA). Not Dated (n.d.). *2011, 2012, and 2013 Year In Review.*

National Aeronautics and Space Administration (NASA). 2001. NASA Procedural Requirements 8580.1. *Implementing the National Environmental Policy Act and Executive Order 12114.* Responsible Office: Facilities Engineering and Real Property Division, NASA Procedural Requirements (NPR) 8820.2F. January 28. http://nodis3.gsfc.nasa.gov/npg_img/N_PR_8580_0001_/N_PR_8580_0001_.pdf. Accessed October 2011.

National Aeronautics and Space Administration (NASA). 2008a. "Facility Project Requirements" Responsible Office: Environmental Management Division, NASA Procedural Requirements (NPR) 8580.1. November 26.

National Aeronautics and Space Administration (NASA). 2008b. *Draft RCRA Facility Investigation Report Santa Susana Field Laboratory, Ventura County, California*. Executive Summary of Group 2 RFI Report. http://www.dtsc-ssfl.com/default.asp?V_DOC_ID=941. November.

National Aeronautics and Space Administration (NASA). 2009a. *Draft Group 3 Remedial Investigation Report at the Santa Susana Field Laboratory, Ventura County, California.* Executive Summary of Group 3 RFI Report. http://www.dtsc-ssfl.com/default.asp?V_DOC_ID=941. March.

National Aeronautics and Space Administration (NASA). 2009b. *Draft Group 9 Remedial Investigation Report at the Santa Susana Field Laboratory, Ventura County, California*. Executive Summary of Group 9 RFI Report. http://www.dtsc-ssfl.com/default.asp?V_DOC_ID=941. November.

National Aeronautics and Space Administration (NASA). 2009c. *Integrated Cultural Resources Management Plan for Santa Susana Field Laboratory, Ventura County, California, January 2009-2013.*

National Aeronautics and Space Administration (NASA). 2010a. "NASA Sitewide Summary of the Sewage Disposal System at the Santa Susana Field Laboratory, Ventura County, California." Technical memorandum. December 10.

National Aeronautics and Space Administration (NASA). 2010b. NASA 2010 ISRA Activities. Santa Susana Field Laboratory, Ventura County, California. November 9, 2010.

National Aeronautics and Space Administration (NASA). 2011a. *Standard Operating Procedures: Building Demolition Debris Characterization and Management for Santa Susana Field Laboratory.* September.

National Aeronautics and Space Administration (NASA). 2011b. *Fall 2010 Habitat and Listed Species Surveys of NASA-Administered Property at Santa Susana Field Laboratory*. February.

National Aeronautics and Space Administration (NASA). 2011c. *Remedial Investigation Work Plan for NASA Sites at the Santa Susana Field Laboratory; Ventura County, California*. March. Rev. 0. Approved May 2012.

National Aeronautics and Space Administration (NASA). 2011d. *2011 Supplemental Biological Surveys of NASA-Administered Property at Santa Susana Field Laboratory.* December.

National Aeronautics and Space Administration (NASA). 2011e. *Santa Susana Field Laboratory−Paleontological Resources Assessment*.

National Aeronautics and Space Administration (NASA). 2012a. "Sitewide Inventory of Tanks, Santa Susana Field Laboratory, Ventura County, California," Technical Memorandum prepared for The Boeing Company (Boeing), U.S. Department of Energy (DOE), and National Aeronautical and Space Administration (NASA). April 6.

National Aeronautics and Space Administration (NASA). 2012b. *Wetlands and Waters of the United States, Delineation for the NASA-Administered Portions of the Santa Susana Field Laboratory, Ventura County, California*. March.

National Aeronautics and Space Administration (NASA). 2013. *Cultural Resources Study for Environmental Cleanup and Demolition at Santa Susana Field Laboratory, NASA Areas I and II, Ventura, California.*

National Park Service (NPS). 2000. Bulletin 36 *Guidelines for Evaluating and Registering Archeological Properties*. Prepared by Prepared by Barbara Little, Erika Martin Seibert, Jan Townsend, John H. Sprinkle, Jr., and John Knoerl for the U.S. Department of the Interior, National Park Service.

NPS. 2013. *Rim of the Valley Special Resource Study*. http://www.nps.gov/pwro/rimofthevalley/. Accessed 24 February 2014.

National Register of Historic Places (NRHP). 2013. State Listings. California, Ventura County. http://www.nationalregisterofhistoricplaces.com/CA/Ventura/state.html. Accessed April 1, 2013.

National Resources Conservation Service (NRCS). Not Dated (n.d.). Web Soil Survey. http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx. Accessed July 12, 2013.

NatureServe. 2013. Nature Serve Explorer. http://www.natureserve.org/explorer/index.htm. Accessed March 31, 2013.

Nicholson, C., C. C. Sorlien, T. Atwater, J. C. Crowell, and B. P. Luyendyk. 1994. "Microplate capture, rotation of the western Transverse Ranges, and initiation of the San Andreas transform as a low-angle fault system." *Geology*, v. 22.

Parise, M., and R. W. Jibson. 2000. "A seismic landslide susceptibility rating of geologic units based on analysis of characteristics of landslides triggered by the 17 January, 1994 Northridge, California earthquake." Elsevier, *Engineering Geology* 58 (2000). January 7.

Regional Water Quality Control Board (RWQCB). 2009. *Fact Sheet for National Pollutant Discharge Elimination Discharge System Permit for the Boeing Company (Santa Susana Field Laboratory)*. NPDES No. CA0001309 Public Notice No. 09-077. March 11, Revised April 6.

Rozaire, C. E. 1959. *Site Record CA-VEN-151.* Ms. on file at the South Central Coastal Information Center, California State University, Fullerton, California. Confidential document.

Rucker. 2009. *Radionuclides Related to Historical Operations at the Santa Susana Field Laboratory Area IV*. 136(NE)/031109, Science Applications International Corporation, March.

Safe Route Info.org. 2013. *Safe Routes to School Guide.* http://guide.saferoutesinfo.org/introduction/the_decline_of_walking_and_bicycling.cfm.

San Joaquin Valley Air Pollution Control District (SJVAPCD). 2002. *Guide for Assessing and Mitigating Air Quality Impacts, Technical Document: Information for Preparing Air Quality Sections in EIRs*. January 10.

Santa Ynez Band of Chumash Indians (SYBCI). 2011. E-mail correspondence on SSFL EIS–Area of Potential Effect from Mr. Sam Cohen, Santa Ynez Band of Chumash Indians Government and Legal Specialist, to Ashley Boudreaux/NASA. December 13.

Santa Ynez Band of Chumash Indians (SYBCI). 2012. Letter correspondence from Vincent Armenta, Santa Ynez Band of Chumash Indians Tribal Chairman, to Charles Bolden NASA Administrator. Santa Susana Field Laboratory (SSFL) designation pursuant to Executive Order 13007 “Indian Sacred Sites” http://www.aachp.gov/EO13007.html. December 10.

Science Applications International Corporation (SAIC). 1994. *Final RCRA Facility Assessment Report for Rockwell International Corporation Rocketdyne Division, Santa Susana Field Laboratory, Ventura County, California*.

Science Applications International Corporation (SAIC). 2009. *Fall Biological Survey Report for Santa Susana Field Laboratory Area IV and Northern Undeveloped Areas*. Prepared for CDM and U.S. DOE. November 13.

South Coast Air Quality Management District (SCAQMD). 1993. *CEQA Air Quality Handbook*. April.

South Coast Air Quality Management District (SCAQMD). 2006. *Rule 1157. PM10 Emission Reductions from Aggregate and Related Operations*. Adopted January 7, 2005, amended September 8, 2006.

South Coast Air Quality Management District (SCAQMD). 2007. *Table XI-A Mitigation Measure Examples: Fugitive Dust From Construction & Demolition*. April.

South Coast Wildlands. 2008*. South Coast Missing linkages: A Wildland Network for the South Coast Ecoregion*. Available at: http://www.scwildlands.org

Squires, R.L., M.H. Link, and I.P. Colburn. 1981. “Introduction.” *Simi Hills Cretacoues Turbidites, Southern California; Volume and Guidebook.* Ed. Martin H. Link, Richard L. Squires, and Ivan P. Colburn. Published by The Pacific Section, Society of Economic Paleontologists and Mineralogists, Los Angeles, California, U.S.A. October 10.

State of California. 1998. Seismic Hazard Zones Official Map, Calabasas Quadrangle. February 1.

State of Nevada. 2011. State of Nevada, Department of Conservation and Natural Resources, Division of Environmental Protection, Bureau of Waste Management; Hazardous Waste Management Permit, US Ecology Nevada, Inc., RCRA Permit NEVHW0025; December 2011

The Boeing Company (Boeing). 2005. *Boeing Santa Susana Field Laboratory Update, The September 2005 Topanga Fire*. November 8

The Boeing Company (Boeing). 2011a. *Third Quarter Progress Report for June 18, 2011 – September 16, 2011 Activity, Interim Source Removal Action (ISRA) and Best Management Practices (BMP) Plan*. Correspondence from Mr. Tom Gallagher, EHS Director, SSFL, to Mr. Peter Raftery, Los Angeles Regional Water Control Board, September 30.

The Boeing Company (Boeing). 2011b. *Phase II Implementation Report — 2010 Activities performed in compliance with the Final Interim Source Removal Action (ISRA) Work Plan, California Water Code §13304 Order (NPDES NO. CA0001309, CI NO. 1111, Site ID No. 2040109)*. Correspondence from Mr. Tom Gallagher, EHS Director, SSFL to Mr. Sam Unger, Los Angeles Regional Water Control Board, September 30.

The Boeing Company (Boeing). 2012. Email correspondence on Current Boeing Excavation Volumes from Mr. Arthur Lenox, Boeing, to Mr. Randy Dean, CH2M HILL, April 16.

The Climate Registry (TCR). 2013. The Climate Registry, General Reporting Protocol, Version 2.0. March.

Transportation Research Board. 2000. *Highway Capacity Manual.* Washington, D.C.

U.S. Army Corps of Engineers (USACE). 2008. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region. (Version 2.0)*. Water Regulatory Assistance Program, Environmental Laboratory, ERDC/EL TR-08-28. September.

U.S. Army Corps of Engineers (USACE). 2013. Letter from Department of the Army, Los Angeles District Corps of Engineers, Ventura Field Office to Allen Elliott, SSFL Project Director. Subject: Approved Jurisdictional Determination regarding presence/absence of geographic jurisdiction. February 12.

U.S. Census Bureau. 1995. *Census Bureau Statistical Brief–Poverty Areas*. June. Available at: http://www.census.gov/population/socdemo/statbriefs/povarea.html.

U.S. Census Bureau. 2011a.Hispanic or Latino Origin by Race, 2007-2011 American Community Survey 5-Year Summary File,. Table B03002. Data file available (with instructions for downloading and extraction) at: http://www.census.gov/acs/www/.

U.S. Census Bureau. 2011b. Ratio of Income to Poverty Level in the Past 12 Months, 2007-2011 American Community Survey 5-Year Summary File, Table C17002. Data file available (with instructions for downloading and extraction) at: http://www.census.gov/acs/www/.

U.S. Census Bureau. 2011c. Population by Sex and Age, American Community Survey 5-Year Summary File, Table B01001. Data file available (with instructions for downloading and extraction) at: http://www.census.gov/acs/www/.

U.S. Census Bureau. 2011d. Selected Housing Characteristics, Table DP-04, 2007-2011 American Community Survey 5-Year Estimates.

U.S. Census Bureau. 2011e. Poverty Thresholds for 2011 by Size of Family and Number of Related Children Under 18 Years. Available at http://www.census.gov/hhes/www/poverty/data/threshld/.

U.S. Census Bureau. 2011f. *Areas With Concentrated Poverty: 2006–2010*. American Community Survey Briefs (ACSBR/10-17). Issued December.

U.S. Census Bureau. 2013a. Los Angeles County Quick Facts. Available at: http://quickfacts.census.gov/qfd/states/06/06037.html.

U.S. Census Bureau. 2013b. Ventura County Quick Facts. Available at: http://quickfacts.census.gov/qfd/states/06/06111.html.

U.S. Department of Agriculture (USDA). 2013. *Plants Database*. http://plants.usda.gov/java/. Accessed March 21, 2013.

U.S. Department of Transportation. 2012. *Traffic Safety Facts*. 2010 Data–Large Trucks. National Highway Traffic Safety Administration. June.

U.S. Department of Transportation. 2013. Federal Motor Carrier Traffic Safety Administration. Available at: http://www.fmcsa.dot.gov/rules-regulations/administration/fmcsr/fmcsrguide.aspx?section_type=D.

U.S. Environmental Protection Agency (EPA). 2009. *Mandatory Greenhouse Gas Reporting Rule: EPA's Response to Public Comments, Volume No.: 14, Subpart A: Definitions, Incorporation by Reference, and Other Subpart A Comments*. Office of Atmosphere Programs, Climate Change Division, Washington, D.C. September.

U.S. Environmental Protection Agency (EPA). 2010a. National Air Toxics Assessments. Available at: http://www.epa.gov/ttn/atw/natamain/index.html. Accessed August 9, 2012.

U.S. Environmental Protection Agency (EPA). 2010b. *Transportation Conformity Guidance for Quantitative Hot-spot Analyses in $PM_{2.5}$ and $PM_{10}$ Nonattainment and Maintenance Areas*. Transportation and Regional Programs Division, Office of Transportation and Air Quality, EPA-420-B-10-040. December.

U.S. Environmental Protection Agency (EPA). 2013a. *Fact Sheet: Greenhouse Gases Reporting Program Implementation (40 CFR Part 98)*. http://www.epa.gov/ghgreporting/documents/pdf/2009/FactSheet.pdf. April. Accessed August 21, 2013.

U.S. Environmental Protection Agency (EPA). 2013b. *Greenhouse Gas Reporting Program: 2012 Data Sets*. http://www.epa.gov/ghgreporting/ghgdata/2012data.html. September. Accessed December 2, 2013.

U.S. Fish and Wildlife Service (USFWS). 2011. *USFWS SSFL Critical Habitat Map.* USFWS Critical Habitat Mapper. Available at: http://criticalhabitat.fws.gov/crithab/. Copyright 2008 ESRI. Printed October 28.

U.S. Fish and Wildlife Service (USFWS). 2012. Information Planning and Conservation System (IPAC). http://ecos.fws.gov/ipac/. Accessed May 17.

U.S. Fish and Wildlife Service (USFWS). 2013. *Endangered Species Database*. http://www.fws.gov/endangered/. Accessed March 21.

U.S. Fish and Wildlife Service (USFWS). 2013b. Letter to Allen Elliott, Subject: Demolition and Cleanup of National Aeronautics and Space Administration–Administered Portions of the Santa Susana Field Laboratory, Ventura County, California. December 13.

Urban Crossroads. 2011. *Santa Susana Field Laboratory Area IV Traffic Noise Analysis, County of Los Angeles, California*. Prepared for John Wondelleck, CDM. JN:07920-02. BL:JS. October 12.

Ventura County. 2011. *Ventura County General Plan, Goals, Policies, and Programs*. County of Ventura Resource Management Authority, Planning Division, Ventura, California. Last amended by Ventura County Board of Supervisors on June 28.Ventura County Air Pollution Control District (VCAPCD). 2003. *Ventura County Air Quality Assessment Guidelines*. October.

Ventura County Air Pollution Control District (VCAPCD). 2006. *Rule 26.2. New Source Review*. Adopted November 22, 1991, revised February 13, 1996, January 13, 1998, and May 14, 2002. Effective March 14.

Ventura County Air Pollution Control District (VCAPCD). 2008a. *Rule 55. Fugitive Dust*. Adopted June 10.

Ventura County Air Pollution Control District (VCAPCD). 2008b. *Rule 74.29. Soil Decontamination Operations*. Adopted October 10, 1995, revised January 8, 2002 and April 8, 2008. Effective July 1.

Ventura County Air Pollution Control District (VCAPCD). 2011a. *Rule 33. Part 70 Permits*. Adopted October 12, 1993, revised September 12, 2006. Effective April 12.

Ventura County Air Pollution Control District (VCAPCD). 2011b. *Rule 35. Elective Emission Limits*. Adopted November 12, 1996. Effective April 12.

Ventura County Air Pollution Control District (VCAPCD). 2011c. *Rule 76. Federally Enforceable Limits on Potential to Emit*. Adopted October 10, 1995, revised September 12, 2006. Effective April 12.

Ventura County Building and Safety. 2011. Ventura County Non-Coastal Zoning Ordinance. Building and Safety. Last updated June 28, 2011.

Ventura County New Homes Directory, 2011. http://www.newhomesdirectory.com/VenturaCounty. Accessed 2011.

Weber, Jr., Harold and Edmund W. Kiessling. 1978. *Historic Earthquakes: Effects in Ventura County. California Division of Mines and Geology, published in California Geology*. Vol. 31., No. 5. May.