

FEBRUARY 14, 2013

AUDIT REPORT

OFFICE OF AUDITS

NASA'S ENVIRONMENTAL REMEDIATION EFFORTS AT THE SANTA SUSANA FIELD LABORATORY

OFFICE OF INSPECTOR GENERAL



National Aeronautics and
Space Administration

REPORT NO. IG-13-007 (ASSIGNMENT NO. A-12-011-01)

Final report released by:



Paul K. Martin
Inspector General

Acronyms

AOC	Administrative Order of Consent
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DOE	U.S. Department of Energy
DTSC	California Department of Toxic Substances Control
EIS	Environmental Impact Statement
EMD	Environmental Management Division
EPA	Environmental Protection Agency
FY	Fiscal Year
GSA	General Services Administration
NEPA	National Environmental Policy Act
OIG	Office of Inspector General
RCRA	Resource Conservation and Recovery Act
SB	Senate Bill
SSFL	Santa Susana Field Laboratory
TCE	Trichloroethylene

OVERVIEW

NASA'S ENVIRONMENTAL REMEDIATION EFFORTS AT THE SANTA SUSANA FIELD LABORATORY

The Issue

The Santa Susana Field Laboratory (Santa Susana or SSFL) is located on 2,850 acres in the Simi Hills of Ventura County, California, approximately 30 miles northwest of downtown Los Angeles. First opened in 1948 in what was then a remote area, the facility was for many years the site of research efforts on civilian use of nuclear energy by the Department of Energy (DOE) and rocket testing for defense and space exploration by the United States Air Force (Air Force) and NASA.¹ Over the years, these activities resulted in radiological and chemical contamination of the soil and groundwater at the site.

NASA is responsible for administering 451.2 acres in two areas of the SSFL site, which includes 41.7 acres of Area I and all 409.5 acres of Area II. The Boeing Company (Boeing) owns and operates the remainder of the SSFL, and the DOE leased property in Area IV from Boeing. The Santa Susana site is home to at least 10 species of sensitive plants and at least 5 species of sensitive wildlife, as well as the Burro Flats Painted Cave, which contains pictographs and petroglyphs created by early Native Americans.

For many years, the Santa Susana facility has been the subject of considerable attention from anti-nuclear activists, environmentalists, and the public. From the mid-1950s until the mid-1990s, DOE and its predecessor agencies conducted civilian nuclear research and energy development projects at the SSFL.² A partial meltdown at one of the nuclear facilities in 1959 led to a release of radioactive contaminants.

Although radioactive contamination remains a concern in the DOE portion of the SSFL, the primary contaminant in the NASA-administered areas of the site is trichloroethylene (TCE), a nonflammable, colorless liquid identified as a potential carcinogen. NASA and the Air Force used large quantities of TCE to clean rocket engines, and prior to the early 1960s when catch basins were installed, allowed the substance to run freely onto the ground. While the Air Force was a large contributor to the TCE contamination, NASA – as the current administrator of the property – has assumed responsibility for the cleanup.

¹ The area has become much less remote over time. More than 500,000 people currently live in southern Ventura County, California, where the SSFL is located.

² DOE's predecessor agency was the Atomic Energy Commission.

NASA, like all Federal agencies, is required to comply with laws and regulations that govern cleanup of contaminants left behind from Agency activities.³ Generally, these laws require responsible parties to conduct risk assessments to identify and evaluate the threat that contaminants pose to human health and structure their remediation efforts based on the results of those assessments. One of the principal factors considered in this type of assessment is the reasonably foreseeable use of the affected property, such as agriculture, housing, industry, or recreation. Each scenario assumes future users will be exposed to some amount of residual contamination at the site, with greater assumed exposure requiring a more stringent cleanup standard. The various clean-up levels potentially applicable to a site like the SSFL include background, residential, and recreational.⁴

Boeing has publicly stated that it intends to preserve its portion of the SSFL site – by far the largest section – for use as open space parkland upon completion of cleanup activities. Similarly, NASA officials told us that the anticipated future use of the NASA portion of the SSFL site is for recreation.

NASA has been involved in cleanup activities at the SSFL since at least the early 1980s. In August 2007, NASA, Boeing, and DOE signed consent orders with California’s Department of Toxic Substances Control (DTSC) agreeing to clean up groundwater and soil at the SSFL to residential exposure levels. Shortly thereafter, in October 2007, California Senate Bill No. 990 (SB 990) was enacted. SB 990 applies only to the SSFL and requires that the site be restored to either a “suburban residential” or a “rural residential (agricultural)” level, whichever will produce the lower permissible residual concentration for each contaminant. The legislation specifically prohibits the sale, lease, or other transfer of the property unless DTSC certifies that the land has undergone complete remediation.

In November 2009, Boeing filed a Federal lawsuit challenging SB 990 as violating the U.S. Constitution. In April 2011, a judge in the United States District Court for the Central District of California ruled in Boeing’s favor and declared the law unconstitutional. The State of California appealed that decision and oral arguments are expected before the U.S. Court of Appeals for the Ninth Circuit in early 2013.

In December 2010, NASA entered into a second agreement with the DTSC known as the Administrative Order of Consent for Remedial Action (AOC). Under the terms of the AOC, NASA agreed that the 2007 consent order would continue to govern its cleanup obligations related to groundwater at Santa Susana, but the Agency would be required to

³ The three primary environmental laws are the National Environmental Policy Act of 1969, 42 U.S.C. §§ 4321-4347; the Comprehensive Environmental Response, Compensation, and Liability Act, 42 U.S.C. §9601 et seq.; and the Resource Conservation and Recovery Act of 1976, 42 U.S.C. §6901 et seq.

⁴ Background level means returning the site to its natural state prior to the introduction of contaminants. Residential level assumes that an adult or child could live on the remediated site 24 hours per day, 350 days per year, for 30+ years. Recreational level assumes that an adult or child could be exposed several hours a day for about 50 days per year over a 30-year period without adverse health effects.

return the soil to its original state before any testing activities occurred – referred to in the AOC as “background” levels. NASA further agreed that it would complete soil cleanup to this standard by 2017.

To comply with the 2010 Order, NASA budget requests include proposed funding increases of approximately \$30 million per year from fiscal years (FYs) 2014 through 2017 (an additional \$120 million total for the 4 years). NASA estimates that cleanup costs for Santa Susana to the AOC standard could cost at least \$200 million. In contrast, estimates to clean the site to a standard suitable for residential and recreational use are in the range of \$76 million and \$25 million, respectively. Santa Susana is not the only pending environmental remediation project at NASA. According to Agency environmental management officials, several other projects pose greater risks to human health and the environment than Santa Susana.

The AOC includes a provision for NASA to follow the National Environmental Policy Act (NEPA), which requires the Agency to complete an Environmental Impact Statement (EIS) for its cleanup activities at Santa Susana.⁵ As part of this process, NASA initially identified five possible alternatives for remediation of the site, including cleaning to residential and recreational use standards. However, NASA’s inclusion of alternatives other than cleanup to background levels caused concern among DTSC officials and California political leaders.

In May 2012, DTSC sent a letter to the NASA Administrator to request that “NASA modify its... process to align itself with... a cleanup of the site to background levels... in compliance with the AOC” rather than evaluate less stringent cleanup alternatives. In addition, Senator Barbara Boxer from California asked the Council on Environmental Quality (CEQ), a White House office that coordinates Federal environmental efforts and works closely with agencies in the development of environmental policies, whether NASA was legally required to consider cleanup options other than background level. After the CEQ advised the Senator that there was no such requirement, NASA limited its EIS process to consideration of only one cleanup standard – background levels.

Given the high cost of the SSFL cleanup and the unusual legal underpinnings of the AOC, we examined whether NASA’s plans to clean up environmental contamination at Santa Susana conform with the laws and standards that generally govern such remediation efforts and provide the best value to the taxpayer. Details of the audit’s scope and methodology are in Appendix A.

Results

NASA has agreed to clean its portion of the Santa Susana site to a level that exceeds the generally accepted standard necessary to protect human health in light of the expected

⁵ An EIS is a detailed evaluation of the Agency’s proposed action and possible alternatives. The public, other Federal agencies, and outside parties may provide input into development of an EIS and are afforded an opportunity to comment on the resulting draft EIS.

future use of the site. Moreover, the cleanup is likely to cost the taxpayers significantly more than the cleanup effort NASA agreed to in its 2007 Consent Order with the State of California – a remediation level itself that was more stringent than what would be required based on the expected use of the site. Although the precise outlines of the cleanup effort and therefore its ultimate cost have not been finalized, NASA estimates that cleaning the SSFL to background levels could cost more than \$200 million, or more than twice the cost to clean it to residential levels and more than eight times the cost to clean it to a recreational use standard. In addition, because cleanup to background levels may require highly invasive soil removal, there is a risk that such a cleanup would result in significant damage to the surrounding environment and to archeological, historical, and natural resources at the site.

Management Action

We recommend that the Administrator, with the assistance of the Associate Administrator for Mission Support, reexamine the Agency's current plans for cleaning the NASA-administered portion of the Santa Susana site and ensure that its environmental remediation is conducted in the most cost-effective manner in keeping with the expected future use of the property.

In accordance with our usual practice, we provided NASA with a draft of this report and requested the Agency respond to our recommendation. Typically, the Agency indicates whether it concurs with our recommendation and describes any corrective actions it plans to undertake to meet the intent of the recommendation. However, in this case NASA declined to indicate whether it agreed or disagreed with our recommendation.

Rather, after noting that NASA "fully appreciates" our recommendation, the Associate Administrator stated that the Agency will continue to work with the DTSC and local community stakeholders "within the requirements" of the AOC and at the same time will "make every effort to implement a [cleanup] program that will achieve both cost avoidance and protection of cultural and natural resources." In addition, the Associate Administrator noted several recent developments that may affect how the AOC is interpreted and implemented. (See Appendix F for Management's Response).

Although we are encouraged by NASA's pledge to work toward a cleanup that achieves cost avoidance and preserves cultural and natural resources, it is not clear that the Agency can achieve the most appropriate and cost-effective remediation effort given the constraints of the current AOC. Accordingly, our recommendation remains unresolved and we will continue to monitor the Agency's efforts to clean the Santa Susana site.

CONTENTS

INTRODUCTION

Background	1
Objectives	9

RESULTS

NASA has Committed to an Excessive and Unnecessarily Costly Cleanup	10
---	----

APPENDIX A

Scope and Methodology	18
Criteria	18
Review of Internal Controls	19
Prior Coverage	19

APPENDIX B

Letter from Senator Boxer to the NASA Administrator	21
---	----

APPENDIX C

Letter from DTSC to the NASA Administrator	22
--	----

APPENDIX D

Letter from CEQ to Senator Boxer	27
----------------------------------	----

APPENDIX E

Letter from the San Fernando Valley Audubon Society to the NASA Assistant Administrator for Strategic Infrastructure	29
--	----

APPENDIX F

Management Comments	32
---------------------	----

APPENDIX G

Report Distribution	34
---------------------	----

INTRODUCTION

Background

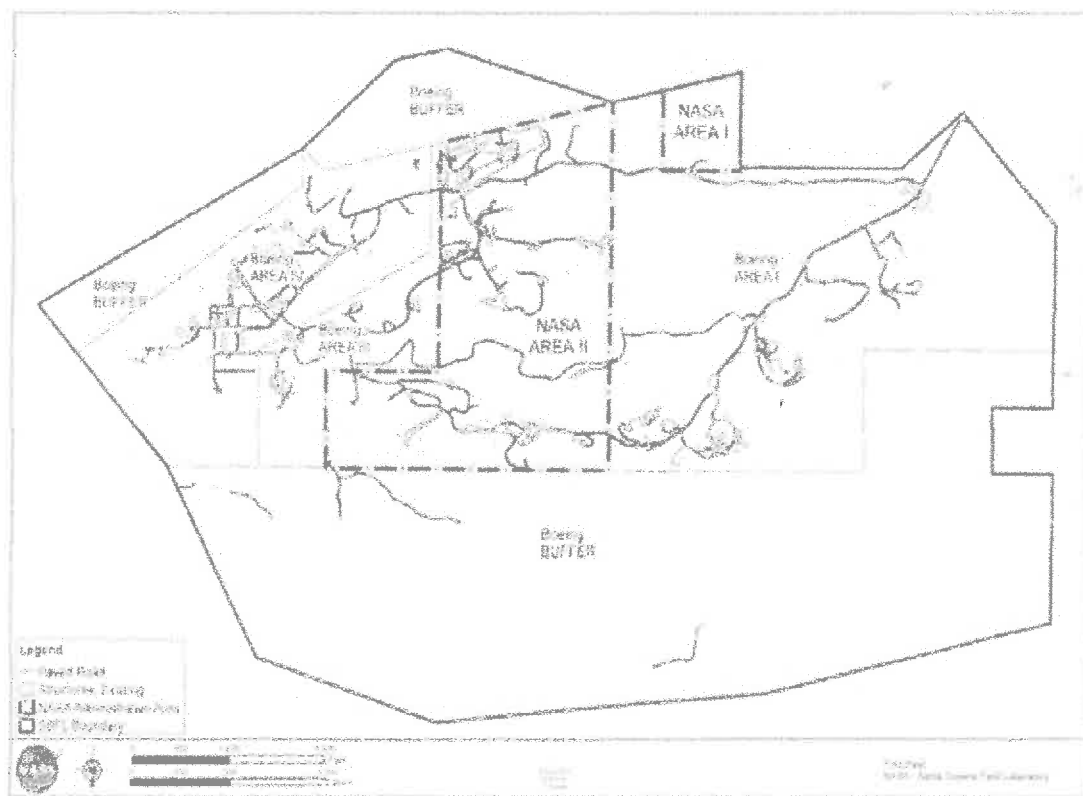
The Santa Susana Field Laboratory (Santa Susana or SSFL) is located on 2,850 acres in the Simi Hills of Ventura County, California, approximately 30 miles northwest of downtown Los Angeles. First opened in 1948 in what was then a remote area, the facility was for many years the site of research efforts on civilian use of nuclear energy directed by the Department of Energy (DOE) and rocket testing for defense and space exploration by the United States Air Force (Air Force) and NASA.⁶ Over the years, these activities resulted in radiological and chemical contamination of the soil and groundwater at the site. NASA ended its testing activities at the Santa Susana site in 2006.

As illustrated in Figure 1, the SSFL is divided into four areas. NASA is responsible for administering 41.7 acres in Area I and all 409.5 acres of Area II. NASA acquired Area II in 1973 and the Area I acreage in 1976 from the Air Force. The Boeing Company (Boeing) – which operated as both a contractor for the Government and in its private capacity – owns and operates the remaining 2,398.8 acres in Areas I, III, and IV. DOE leases property in Area IV from Boeing. The site is home to at least 10 species of sensitive plants, at least 5 species of sensitive wildlife, and to the Burro Flats Painted Cave, which contains pictographs and petroglyphs created by early Native Americans.⁷

⁶ The area has become much less remote over the past several decades. At the time of our review, more than 500,000 people live in southern Ventura County, California, where the SSFL is located.

⁷ Pictographs are rock art paintings and petroglyphs are rock art that has been scored or cut into the rock surface.

Figure 1 - Santa Susana Field Laboratory



Source: NASA Santa Susana Field Fact Sheet

For many years, the Santa Susana facility has been the subject of considerable attention from anti-nuclear activists, environmentalists, and other members of the public. From the mid-1950s until the mid-1990s, DOE and its predecessor agency conducted nuclear research and energy development projects at Area IV of the SSFL, including nuclear operations (development, fabrication, disassembly, and examination of nuclear reactors, reactor fuel, and other radioactive materials) and large-scale experiments for testing fast breeder reactor components.⁸ A partial meltdown in 1959 at a nuclear facility operated by a DOE predecessor agency led to the release of radioactive contaminants. As a result of these and other activities, various locations on the site contain radioactive and chemical contamination. Although DOE's predecessor agency issued a press release a few weeks after the meltdown incident, individuals and groups in California have raised concerns over the years about the adequacy of the public disclosures and the potential health risks posed by the contamination.

The primary contaminant in the NASA-administered areas of the site is trichloroethylene (TCE), a nonflammable, colorless liquid that has been identified as a potential

⁸ DOE's predecessor agency was the Atomic Energy Commission.

carcinogen. NASA and the Air Force used large quantities of TCE to clean rocket engines and prior to the early 1960s when catch basins were installed, allowed the substance to run freely onto the ground. NASA has determined that over the years more than 500,000 gallons of TCE were released to the ground at the Santa Susana site. While the Air Force was a large contributor to the TCE contamination at the SSFL, NASA – as the current administrator of the property – has assumed responsibility for the cleanup. See Figure 2 for NASA test stands and surrounding area at Santa Susana.

In October 2007, frustrated by the pace of clean-up efforts at Santa Susana, the California legislature enacted Senate Bill (SB) 990, which prescribes specific remediation requirements for the SSFL, including that the site be restored to accommodate either “suburban residential” or “rural residential” use, whichever will produce the lower permissible residual concentration for each contaminant.⁹ The legislation specifically prohibits the sale, lease, sublease, or other transfer of the property unless the California Department of Toxic Substances Control (DTSC) certifies that the land has undergone complete remediation. In November 2009, Boeing challenged the constitutionality of SB 990 in Federal court. Although the company won its suit at the district court level, the State has appealed that ruling to the U.S. Court of Appeals for the Ninth Circuit.

⁹ At the time SB 990 was enacted, “Suburban Residential” referred to safe exposure levels for a residential or community neighborhood area and “Rural Residential” referred to safe exposure levels for an agricultural or farmland area where food is grown or livestock is raised. “Background” and “Rural Residential” refer to similar levels of cleanup. At the time of preparation of NASA’s Cost Estimates, NASA’s EIS documents, and NASA’s EIS presentation to the community in 2012, the terminology for the exposure levels under consideration was more generalized and the levels identified were (1) Background, (2) Residential, (3) Industrial, (4) Recreational, and (5) No Action.

Figure 2 - NASA Test Stands and Surrounding Area at SSFL

Source: OIG (May 2012)

In 2009, NASA reported the SSFL as excess property to the General Services Administration (GSA), one of the first steps in the formal process of divesting itself of the property. GSA will decide how the NASA portion of the SSFL will ultimately be disposed of. While Boeing is cleaning its portion of the SSFL site – by far the largest section – to residential cleanup standards, it has publicly stated that it intends to preserve the area for use as open space parkland upon completion of its cleanup activities. Although they have no formal role in the ultimate disposition of the NASA-administered property, Agency officials said they also expect this portion ultimately will be used as a recreational area.

Federal and State Laws Govern Environmental Remediation of Facilities. A complex collection of Federal and state laws govern remediation of environmental contamination at sites like the SSFL. The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), also known as the “Superfund,” addresses remediation at inactive and abandoned hazardous waste sites.¹⁰ The Federal Government controls cleanup of areas designated as Superfund sites. In addition, the Resource Conservation and Recovery Act (RCRA) sets up an environmental corrective action program administered by the U.S. Environmental Protection Agency (EPA) and 43 authorized states and territories to work with responsible facilities to investigate and clean up hazardous releases.¹¹ Under RCRA, regulatory authority over site cleanup may be delegated to a state. The National Environmental Policy Act (NEPA) requires Federal

¹⁰ The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), codified at 42 U.S.C. §9601 et seq. (1980).

¹¹ The Resource Conservation and Recovery Act (RCRA) of 1976, codified at 42 U.S.C. §6901 et seq. (1976).

agencies to consider the environmental impacts of their actions and reasonable alternatives to those actions.¹² Under the statute, agencies must publicly disclose their proposed actions (including alternatives), consider and address any comments they receive from the public following that disclosure, and prepare Environmental Impact Statements (EIS) for activities that will have a significant effect on the environment.¹³ NEPA also created the Council on Environmental Quality (CEQ), a White House office that coordinates Federal environmental efforts and works closely with agencies in the development of environmental policies.¹⁴

Because Santa Susana is located in California, the state's environmental laws and regulatory apparatus also affect cleanup of the site. According to the DTSC policy, remediation efforts should "take into consideration the future land use of the site to ensure that remedial action protective of public health and the environment."¹⁵ In addition, California enacted SB 990 in 2007 to address contamination at the SSFL.

Federal law requires responsible parties to conduct risk assessments to identify and evaluate the threat that contaminants pose to human health and structure their remediation efforts based on the results of such assessments. These assessments determine the risk posed to human health and the environment by any contamination that will remain at the site upon completion of a cleanup. One of the principal factors considered in such an assessment is the reasonably foreseeable use of the affected property, such as agriculture, housing, industry, or recreation. Each scenario assumes future users will be exposed to some amount of residual contamination at the site, with greater assumed exposure requiring a more stringent cleanup standard.

For example, a site likely to be used for growing food would require a more extensive remediation effort, while one expected for industrial use would require a less stringent cleanup and therefore permit higher concentrations of contaminants to remain on the site. Under the normal assessment process, the reasonably foreseeable future use of a site is determined by considering several factors, including the current use of the land, general land use plans, topography and natural resources, cultural resources, and the presence of endangered species.

¹² The National Environmental Policy Act of 1969 (NEPA), as amended, codified at 42 U.S.C. §§ 4321-4347.

¹³ An Environmental Impact Statement (EIS) is a detailed evaluation of the Agency's proposed action and possible alternatives. The public, other Federal agencies and outside parties may provide input into development of an EIS and then are afforded an opportunity to comment on the resulting draft EIS.

¹⁴ The Council on Environmental Quality oversees NEPA. The duties of the Council include gathering information on the conditions and trends in environmental quality; evaluating federal programs in light of the goals established in NEPA; developing and promoting national policies on environmental quality; and conducting studies, surveys, research, and analyses relating to ecosystems and environmental quality.

¹⁵ DTSC policy titled "Oversight and Supervision of Investigations and Removal and Remedial Actions at Hazardous Substance Sites," effective July 1, 1992.

Table 1 shows the various cleanup or remediation levels possible for a site like the SSFL and the underlying assumptions associated with each level.

Table 1: Definition of Cleanup Level

Cleanup Level	Definition (Assumptions for Establishment of Exposure Limits)
Background	Returns the environment to its natural state prior to the introduction of contaminants.
Residential	Assumes that an adult or child could live on the remediated site 24 hours per day, 350 days per year, for 30+ years without adverse health impacts.
Industrial	Assumes workers could remain on the remediated site for 8 to 10 hours per day, 250 days per year over a 25-year period without adverse health impacts.
Recreational	Assumes that an adult or child could be exposed several hours per day for about 50 days per year over a 30-year period without adverse health impacts.

Source: NASA SSFL Fact Sheet

NASA Signed Consent Orders with State of California Governing Remediation at the SSFL. NASA has been involved in cleanup activities at the SSFL since at least the early 1980s. In August 2007, NASA, Boeing, and DOE signed a Consent Order for Corrective Action with the DTSC under which the Agency committed to clean up groundwater and soil in the portions of the SSFL it administers to “residential” exposure levels. According to the Federal district court that heard Boeing’s legal challenge to SB 990, it is undisputed that cleanup to the residential level will fully protect human health and environment. Shortly after this Consent Order was signed, the California legislature enacted California Senate Bill (SB) 990, which imposes a stricter clean-up standard than the Consent Order.

In December 2010, NASA entered into another agreement with DTSC known as the Administrative Order of Consent for Remedial Action (AOC).¹⁶ Under the terms of the AOC, NASA agreed that the 2007 Consent Order would continue to govern its cleanup obligations related to groundwater at Santa Susana (i.e., residential level), but the Agency would be required to clean the soil to the more stringent “background” level. NASA further agreed that soil cleanup at the site would be completed by 2017. According to a press release issued by the California EPA at the time, the AOC “meets the high bar set by Senate Bill 990 which requires the entire SSFL property to be cleaned up to stringent and protective standards, and places the cleanup of both chemical and radioactive contamination under the oversight of DTSC.”

¹⁶ Under California state law, an Administrative Order of Consent is an agreement signed by the DTSC and an individual, business, or other entity through which the violator agrees to take the required corrective actions or to refrain from an activity.

At NASA's insistence, the AOC includes a provision requiring the Agency to "make its specific decisions on how to conduct the cleanup to background defined in this Agreement in accordance with the requirements of [NEPA]." Accordingly, in August 2011, NASA held a series of public meetings as part of the process to define the scope and range of considerations for the draft EIS.¹⁷ In March 2012, NASA held another public meeting to update the community on their efforts to draft the EIS. In their public presentation, NASA officials identified five possible alternatives for remediation of the site, including cleaning to residential and recreational standards.

NASA's inclusion of alternatives other than a cleanup to background levels caused concern among DTSC officials, California political leaders, and some interest groups.¹⁸ In March 2012, California Senator Barbara Boxer sent a letter to the NASA Administrator citing NASA's commitment to "clean up the site to the conditions that existed prior to NASA's activities." In May of that year, DTSC sent a letter to the Administrator to request that "NASA modify its NEPA process to align itself with ... a cleanup of the site to background levels ... in compliance with the AOC." That same month, Senator Boxer sent a letter to the CEQ asking whether NEPA required NASA to evaluate alternatives other than background level. In its June 2012 response, the CEQ advised "... there is no requirement that NASA consider alternatives that cleanup to other standards that differ from the agreement with the State."¹⁹ Thereafter, NASA limited its EIS process to consideration of only two alternatives: cleanup to background and "no-action."²⁰

NASA officials expect to complete a draft EIS by spring 2013. Under the terms of the AOC, this draft will be shared with DTSC for comment, followed by a public comment period. Thereafter, NASA will draft the final EIS.

¹⁷ Scoping is an early step in the NEPA process that helps the Agency prepare a comprehensive EIS by identifying environmental resources and concerns important to the community. The scoping process does not resolve differences concerning the merits of a project or anticipate the ultimate decision about a proposed project.

¹⁸ For example, in September 2011 the Natural Resources Defense Council and the Committee to Bridge the Gap stated "We recommend that NASA narrow the scope of its environmental analysis to the decisions about which it has discretion and which do not violate the AOC, i.e., the dismantlement of structures at the site (to the extent your regulator DTSC decides such alternatives would not interfere with the cleanup of toxic contamination at, around, or beneath them) and/or the *implementation* of the cleanup to background (to the extent those implementation decisions are not the purview of the DTSC as your regulator). NASA should clarify that any review will not include consideration of *whether* to comply with the AOC's requirement of cleanup to background but will be restricted, as required by the AOC, to *how* to do so." [emphasis in original].

¹⁹ The Supreme Court has recognized that the CEQ's interpretation of NEPA is entitled substantial deference. See Robertson v. Methow Valley Citizens Council, 490 U.S. 332, 355-56 (1989) and Andrus v. Sierra Club, 442 US 347.358 (1979).

²⁰ See Appendix B for the letter from Senator Boxer to the NASA Administrator, Appendix C for the letter from the DTSC to the NASA Administrator, and Appendix D for the letter from the CEQ to Senator Boxer.

Until the NEPA process is concluded, NASA cannot recommend a final course of action for the Santa Susana cleanup. However, not considering the full range of cleanup options as part of the NEPA process elevates the risk of challenges to NASA's NEPA process. In contrast, because the Agency committed itself to cleaning up the site to background levels in the AOC, NASA may leave itself exposed to a legal challenge from California if it does not honor that commitment.

Costs and Effects of NASA's Environmental Remediation Efforts at SSFL. NASA estimates that the amount to clean the Santa Susana site to background levels could cost more than \$200 million.²¹ In comparison, estimates to clean the site to a standard suitable for residential and recreational use are approximately \$76 million or \$25 million, respectively. To fund its cleanup efforts under the terms of the 2010 AOC, NASA plans to request funding increases from Congress of approximately \$30 million per year from FYs 2014 through 2017.²²

NASA's Environmental Management Division (EMD) prioritizes Agency remediation projects using a scoring system that measures risk to human health and the environment.²³ In addition, NASA considers political risk in making the prioritization decisions for its remediation projects. Under EMD's risk matrix, 25 is the highest possible score a project can receive. For FY 2012, EMD listed 89 NASA environmental remediation projects, including 7 associated with the SSFL cleanup. The Santa Susana projects each received a score of 23. Thirteen other projects, including a project to remove contaminants from the drinking water used by communities surrounding the Jet Propulsion Laboratory (JPL) received scores of 23 or higher. EMD's remediation list for FY 2013 contains 99 projects, 13 of which are associated with the SSFL. Four of the SSFL projects received scores of 25 and the remaining SSFL projects received scores of 23. NASA's project list also included 25 other projects that received scores of 23 or higher.

Boeing's Legal Challenges to SB 990. In April 2011, the Federal judge assigned to hear Boeing's challenge to SB 990 ruled that the law violates the Supremacy Clause of the U.S. Constitution because it regulates the disposal of radioactive waste, an area within the exclusive jurisdiction of the Federal Government. In addition, the District Court judge held that SB 990 violated the doctrine of intergovernmental immunity because it treats Boeing more harshly than other private landowners.²⁴ The Federal Government was not a party to this case and the ruling does not directly affect NASA. However, because SB 990 formed the basis for the AOC, the ruling may provide NASA an opportunity to reexamine its approach to the SSFL cleanup.

²¹ The estimate includes the cost of cleaning up the soil under the terms of the AOC. It does not include the cost of cleaning up the groundwater, which is still governed by the 2007 Consent Order.

²² NASA's planned request for funding increases for FYs 2014 through 2017 do not cover the full cost of the cleanup effort. The remaining cost would be taken from the existing budget.

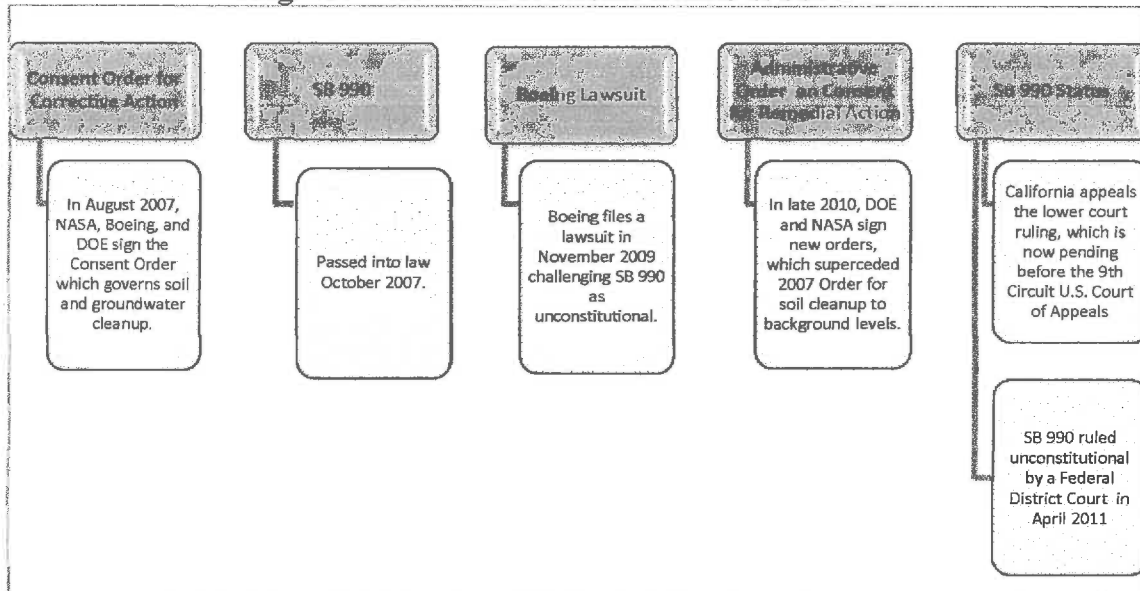
²³ The term "environment" in this context includes the threat to human health.

²⁴ *Boeing Co. v. Robinson*, Case number: 10-4839-JFW (MANx), 2011 (C.D. Cal. Apr. 26, 2011).

INTRODUCTION

The State of California has appealed the District Court’s ruling, and oral arguments are expected before the U.S. Court of Appeals for the Ninth Circuit in early 2013. In the meantime, Boeing has continued its efforts to clean its portion of the SSFL site to a residential exposure level. See Figure 3 for the timeline of recent events at SSFL.

Figure 3 – Timeline of Recent Events at SSFL



Source: NASA OIG

Objectives

In this audit, we examined whether NASA’s plans to clean up environmental contamination at the SSFL conform with the laws and standards that generally govern such remediation efforts and provide the best value to the taxpayer. See Appendix A for details of the audit’s scope and methodology, criteria, our review of internal controls, and a list of prior coverage.

NASA COMMITTED TO AN EXCESSIVE AND UNNECESSARILY COSTLY CLEANUP

NASA has agreed to clean its portion of the Santa Susana site to a level that exceeds the generally accepted standard necessary to protect human health in light of the expected future use of the site. Moreover, the cleanup is likely to cost taxpayers significantly more than the cleanup effort NASA agreed to in its 2007 Consent Order with the State of California – a remediation level that was more stringent than what would be required based on the expected use of the site. Although the precise outlines of the cleanup effort and therefore its ultimate cost have not been finalized, NASA estimates that the cost to clean the soil to background levels could exceed more than \$200 million. This is more than twice the cost to clean the site to residential levels and more than eight times the approximately \$25 million NASA estimates it would cost to clean the site to a recreational use standard.²⁵ In addition, because cleanup to background levels may require highly invasive soil removal, there is a greater risk that such a cleanup may result in significant damage to the surrounding environment as well as to archeological, historical, and natural resources at the site.

NASA's Remediation Plan Commits the Agency to a Cleanup Standard Not Based on Risk to Health. Environmental cleanup standards generally are set after measuring the risks to human health in light of the expected future use of the property. While Boeing is cleaning its portion of the SSFL site – by far the largest section – to residential cleanup standards, it has publicly stated that it intends to preserve the site for use as open space parkland upon completion of its cleanup activities. Although final disposition of the NASA-administered portions of the SSFL lies with the GSA, NASA officials said they also expect the Agency's portion will ultimately be used for recreation. According to NASA, DOE, and EPA officials and in light of this expected land use, a normal NEPA process – where the full range of alternatives would be identified and evaluated prior to deciding on the course of action – would likely have led to a decision to clean the area to a less stringent standard than background levels. Although California officials have not yet established the specific criteria necessary for NASA to achieve background levels for the various contaminants at the site, these levels are expected to approximate the natural concentrations that would have been found in the soil prior to any rocket testing activities.

Less Costly Cleanup Alternatives Exist. NASA estimates potential costs of more than \$200 million to clean its portion of the SSFL site to background levels to meet the terms of the AOC. This compares to \$76 million to make the site appropriate for residential use and \$25 million for recreational use. As shown in Table 2, the possible scenarios for NASA's remediation efforts at the SSFL site vary considerably in effort required and in

²⁵ The estimates above are for the soil cleanup at SSFL based on the 2010 AOC. They do not include the cost of groundwater cleanup, which is still governed by the 2007 agreement.

cost. For example, the difference in making the site suitable for residential use versus achieving background levels is approximately \$133 million. DTSC officials told us they believe NASA’s cost estimate for achieving background levels is overstated, but NASA officials insist their estimates are based on the effort that would be required to meet the 2017 deadline and the exposure levels the DTSC previously required in the 2007 Consent Order.

Table 2: Cleanup Levels and Associated Soil Removal and Cost Estimates

Cleanup Level	Estimated Amount of Soil to be Removed (cubic yards)	NASA’s Estimated Cost
Background (required under AOC)	502,000	\$209 million
Residential	182,000	\$76 million
Industrial	92,000	\$37 million
Recreational (expected future land use for SSFL)	58,000	\$25 million
No Action	Not Applicable	Not Applicable

Source: NASA presentation to the community surrounding the SSFL.

Interests of Outside Parties Played a Significant Role in NASA’s Cleanup Decision.

Although the NASA Administrator ultimately agreed to the AOC, other NASA officials involved in discussions about the Santa Susana cleanup expressed reservations about the terms of the agreement, with one senior official writing “... be advised that I believe [the AOC] to be inappropriately written and executed and sign it with reservations.” According to NASA officials, input from members of Congress and local California leaders as well as advice from the CEQ played a significant role in the Agency’s decision to agree to the terms of the AOC and in its subsequent decision to exclude clean-up alternatives other than background levels from further consideration in the NEPA process.

NASA, Boeing, and DOE officials told us that political interest in the SSFL cleanup is rooted in a long history of community distrust about the Federal Government’s activities at the site, particularly the nuclear testing and research the Government conducted there in the 1950s. According to DOE officials, a partial meltdown of one of the nuclear reactors at DOE’s portion of the site in 1959 has been a longstanding focus of public attention and suspicion from anti-nuclear groups.²⁶ DTSC officials also cited community distrust as one of the reasons California has taken a particularly aggressive approach to the SSFL cleanup.

As part of the NEPA scoping process, NASA identified five possible alternatives for remediation of the soil at the SSFL site, including cleaning to residential and recreational use standards. However, NASA’s inclusion of the full range of possible clean-up alternatives caused concern among DTSC officials and California political leaders. The

²⁶ In fall 2012, the EPA released preliminary results showing lingering radiological contamination in the DOE-managed portion of the SSFL.

State asked NASA to limit the NEPA process to the standard agreed to in the AOC. In a letter to the NASA Administrator dated March 29, 2012, Senator Boxer raised concerns that NASA might be backing away from its agreement with California to clean up the site "... to the conditions that existed prior to NASA's activities." The letter stated:

I was alarmed to learn that NASA has threatened to unilaterally move forward without addressing the state's legitimate concerns and without laying the groundwork for protecting public health in a manner that is consistent with its agreement. I share California's very serious concerns about what appears to be NASA's apparent disregard of the commitment that it has made to the state and its citizens.

Senator Boxer sent a letter to the CEQ in early May 2012 asking whether NEPA required NASA to consider alternative levels of remediation for Santa Susana (such as residential or recreational levels) in light of its agreement to clean up the site to a background level. In her June 2012 letter to Senator Boxer, the chair of the CEQ responded:

CEQ encourages agencies to carry out robust alternative analyses that consider all reasonable alternatives, including those that are not within the 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 [the AOC] 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 other standards that differ from the agreement with the State.

The CEQ Chair noted that because the Agency had committed to clean up the Santa Susana site to background levels, "... NASA is not compelled to consider less comprehensive cleanup measures as alternatives."²⁷

CEQ officials told us that although they understood the costs to clean the SSFL site to background levels were potentially greater than the costs associated with the cleanup standard outlined in the 2007 consent order, they advised NASA of several other factors to consider, including:

... the State of California's sovereign determination that there was a benefit to its environment and its citizens derived from a cleanup to background as represented by its legislation and its administrative enforcement actions; the contamination represented a legacy cost of rocket testing, rather than a new operating expense; the cleanup's projected costs did not seem out of proportion to other similarly complex cleanups; the Federal Government's involvement at this site had been longstanding; the length of the cleanup dispute had been substantial; the contamination was of a highly toxic nature; the continued deeply-felt health concerns by the community over many years; the site's location in proximity to highly populated areas; the strongly-held views of State and Congressional delegation officials; and the pendency of Federal legislation introduced by California's Senators that could affect the parties' obligations regarding the site.

²⁷ The letter from CEQ Chair Nancy H. Sutley describes the CEQ's role as overseeing "implementation of NEPA, principally through issuance and interpretation of NEPA regulations that implement the requirements of NEPA." Chair Sutley's letter is included in Appendix D of this report.

Uncertainty Remains Concerning Required Cleanup Methods and Associated Costs.

According to the AOC, the DTSC is responsible for determining the specific parameters defining the local background levels for the SSFL site. As part of this effort, the DTSC plans to prepare “look-up tables” identifying the level of chemical concentrations that may remain on the site after cleanup, which in turn will determine the cleanup methods NASA will use and how much soil the Agency will need to remove from the site. Although, DTSC officials told us they expect to develop these look-up tables by the end of 2012, NASA has not received the tables as of early January 2013.

Until the DTSC sets these levels, it remains unclear which specific methods NASA can use to clean the site and therefore difficult to estimate the total cost of the cleanup. During the course of our audit, we found that NASA, DOE, Boeing, and DTSC have different interpretations regarding what the AOC allows and the extent of efforts necessary to achieve the standards outlined in the agreement. For example, confusion among the parties appears to exist about whether certain “leave in place” remediation methods are viable options or whether all of the contaminated soil would need to be removed and replaced. The AOC provides that “cleanup to background levels” requires removal of soils that do not meet the articulated background standard. However, another provision of the agreement suggests that “in situ or other onsite treatment of soils” may be used if they will achieve the required remediation standard.²⁸ According to DTSC officials, such onsite options could include oxidation/reduction, biological treatment, and soil vapor extraction.²⁹

NASA, DOE, and Boeing officials told us that putting aside the apparent contradictory language in the agreement; it would not be possible to meet the 2017 deadline using the onsite cleanup methods identified by the DTSC. In the view of these officials, cleaning the site to background levels by 2017 would require NASA to excavate and remove 502,000 cubic yards of soil from the site to meet the cleanup standard required by the AOC.³⁰ According to NASA officials, meeting this cleanup standard under this table would require a cadre of employees working 24 hours a day/7 days a week for approximately 2 years. They asserted that such a level of effort is not realistic given the number of trucks that would be needed to remove the contaminated soil and the deleterious effect such an undertaking would have on the surrounding residential neighborhoods. They also noted that less stringent cleanup levels would require less soil be removed from the site, which would be more cost-effective and less disruptive to the surrounding community. In their response to our inquiry, CEQ officials also stated that due to the length of time needed for the NEPA process, as well as California’s own

²⁸ AOC Section 1.7.2 through Section 1.7.2.2

²⁹ Oxidation/reduction involves the injection of strong oxidants such as hydrogen peroxide, ozone gas, potassium permanganate or persulfates into the soil to enhance oxidation. Biological treatment, also known as bioremediation, treats environmental problems through biological means. Soil vapor extraction removes contamination from soil through air or steam.

³⁰ Boeing estimated that cleaning the entire Santa Susana site to this standard would require the removal of approximately 1.6 million cubic yards of soil – enough soil, according to the company, to fill the Rose Bowl in Pasadena three or four times.

environmental analysis, they did not believe there would be sufficient time to perform the cleanup by the 2017 deadline.

Other Remediation Projects Pose Greater Risk to Human Health than Santa Susana. According to NASA Headquarters personnel, although the SSFL project is a top priority because of intense community and political interest, it poses less of a health risk than other sites on NASA's environmental cleanup list.

The Agency's FY 2013 budget request of \$66 million for its Environmental and Compliance Restoration Program includes an increase of approximately \$30 million per year from FYs 2014 through 2017 (compared to the FY 2011 budget) to help fund the SSFL cleanup. However, NASA officials said if the Agency does not receive the requested increase it may be forced to delay the cleanup or redirect funding from other projects that, according to its priority list, pose a greater health risk.

Cleanup to Background Levels Could Pose Significant Risk of Damage to the Local Environment and Agricultural Resources. Because the specific cleanup methods have yet to be determined, their ultimate impact on the Santa Susana site is uncertain. Nevertheless, because cleanup to background levels may involve highly invasive soil removal activities, the cleanup process itself may result in significant damage to the surrounding environment and to archeological, historical, and natural resources at the SSFL.

According to NASA, DOE, and Boeing officials, excavation and removal of contaminated soil could result in unplanned human and environmental health risks due to increased truck traffic, creation of additional access roads into the property, damage to residential and public roadways, air pollution, and contamination due to debris falling off the trucks. In addition, removing the projected amount of soil may significantly alter the natural beauty of the property. See Figure 4 for a view of the area surrounding the SSFL.

Figure 4 – View of Area Surrounding SSFL



Source: OIG (May 2012).

RESULTS

Moreover, once the contaminated soil has been removed, additional soil would need to be hauled in to restore the site to a natural state. Officials from NASA, DOE, and Boeing expressed concerns that it may be difficult to find soil for backfill that meets the stringent standards, as well as bringing in “foreign soil” may introduce seeds or other materials that are not native to the area, thereby negatively affecting plants and animals at the site. In addition, at least one public interest group has expressed concerns about the effect the cleanup could have on the natural and historical resources present at the site.³¹

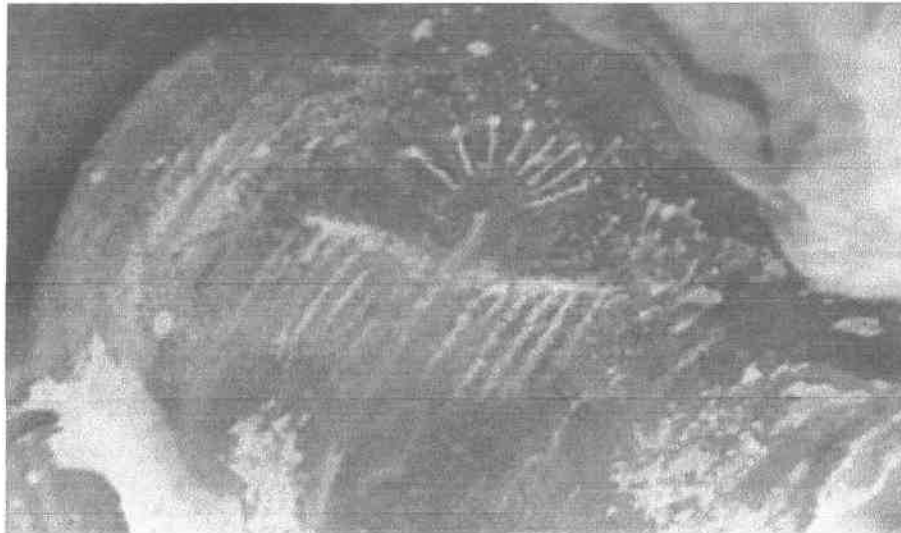
The State of California has designated nearly 100 acres of the SSFL site as high priority natural conservation habitat and parts of the property are federally designated wetlands.³² In addition, the site is home to at least 10 species of sensitive plants, including the southern willow scrub, the Ventura Coastal sage scrub, coastal live oak, and the Santa Susana tarplant, and to at least 5 species of sensitive wildlife, including the coast horned lizard and the two-striped garter snake.

Extensive soil removal could also damage archeological resources at the Santa Susana site, including the Burro Flats Painted Cave, which is located on NASA’s portion of the site and contains pictographs and petroglyphs created by early Native Americans.³³ According to NASA, archaeologists have described the Painted Cave as containing some of the best-preserved and finest examples of prehistoric pictographic art in North America. In addition, the Cave is listed on the National Register of Historic Places. See Figure 5 for a sample of pictographic art at Burro Flats Painted Cave.

³¹ September 19, 2012, letter to the NASA Administrator from the San Fernando Valley Audubon Society. (See Appendix E for the full text of the letter).

³² The Environmental Protection Agency works in partnership with states, tribes, local governments, the private sector, and citizen organizations to monitor, protect, and restore valuable designated wetlands, which are home to sensitive species. Sensitive species are species whose populations are reducing and that are or potentially may become endangered.

Figure 5 – Pictographic Art from Burro Flats Painted Cave



Source: NASA Santa Susana Field Laboratory Fact Sheet

Conclusion

NASA officials faced very difficult choices when deciding how to proceed with the environmental cleanup at Santa Susana. As stewards of taxpayer dollars they are required to comply with various Federal laws and processes intended to ensure that environmental risks are properly assessed to identify the most cost-effective method of remediation. Conversely, political leaders and segments of the California public pushed aggressively for the strict cleanup standard outlined in the AOC. In the end, NASA agreed to the most extensive and expensive remediation option for its Santa Susana property – clean up to background level.

We question whether NASA's agreement to clean its portion of the SSFL to background levels is the best use of limited NASA environmental remediation funds, particularly in light of the expected use of the property and the Agency's need to address other higher-risk environmental issues. NASA's estimate of more than \$200 million to clean the site to background levels is more than two times the cost of restoring the land for residential use and more than eight times the estimated cost of restoring the site for recreational use. Given NASA's other environmental commitments and the fiscal constraints facing the Agency and the Nation, NASA can ill afford to spend tens of millions of dollars to clean up an area beyond its risk level or expected land use. Moreover, we are concerned about the potential adverse effects on the surrounding community and on natural and archeological resources at the site should NASA press forward with a cleanup to background levels.

NASA still has several opportunities to reduce the ultimate cost of its Santa Susana cleanup. Among other options, the Agency may be able to negotiate with the DTSC

regarding the 2017 deadline and the potential use of on-site cleanup methods that would reduce or eliminate the need to haul away half a million cubic yards of soil. Moreover, resolution of Boeing's challenge to the constitutionality of SB 990 may inform the Agency's position in discussions with California environmental officials about the scope and timetable of its cleanup effort.

Recommendation, Management's Response, and Evaluation of Management's Response

Recommendation 1. We recommend that the Administrator, with the assistance of the Associate Administrator for Mission Support, reexamine the Agency's current plans for cleaning the NASA-administered portion of the Santa Susana site and ensure that its environmental remediation is conducted in the most cost-effective manner in keeping with the expected future use of the property.

Management's Response. The Associate Administrator declined to indicate whether it agreed or disagreed with our recommendation. Rather, after noting that NASA "fully appreciates" our recommendation, he stated that the Agency will continue to work with the DTSC and local community stakeholders "within the requirements" of the AOC and at the same time will "make every effort to implement a [cleanup] program that will achieve both cost avoidance and protection of cultural and natural resources." In addition, the Associate Administrator noted several recent developments that may affect how the AOC is interpreted and implemented. Specifically, he mentioned that the United States Court of Appeals for the Ninth Circuit recently invited the Solicitor General of the United States to be heard on Boeing's challenge to the constitutionality of SB 990 and that the Santa Ynez Band of Chumash Indians has expressed concerns about the impact the cleanup could have on sacred heritage interests at the site. (See Appendix F for Management's Response).

Evaluation of Management's Response. Although we are encouraged by NASA's pledge to work toward a cleanup that achieves cost avoidance and preserves cultural and natural resources, it is not clear that the Agency can achieve the most appropriate and cost-effective remediation effort given the constraints of the current AOC. Accordingly, our recommendation remains unresolved and we will continue to monitor the Agency's efforts to clean the Santa Susana site.